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Supreme Court, U.S.
FILED
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CLERK

No. 99-8508

IN THE

Supreme Court of the United States

DANNY LEE KYLLO,

Petitioner,

v.

UNITED STATES OF AMERICA,

Respondent.

On Writ of Certiorari to the United States Court of Appeals for the Ninth Circuit

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JOINT APPENDIX

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PETITION FOR CERTIORARI FILED MARCH 3, 2000
CERTIORARI GRANTED SEPTEMBER 26, 2000

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IN THE
NINTH CIRCUIT COURT OF APPEALS

Docket # 93-30231

USA,

v.

KYLLO,

Appeal from: District of Oregon (Portland)

DOCKET ENTRIES

DATE	PROCEEDINGS
June 18, 1993	Appeal Filed
September 24, 1993	Appellant's opening brief filed
October 26, 1993	Appellee USA's brief filed
November 5, 1993	Appellant's reply brief filed
May 5, 1994 Oral	Argument; Case Submitted
June 14, 1994	Memorandum Opinion Filed Remanding To District Court
September 29, 1994	Order Withdrawing Memorandum Opinion
October 4, 1994	Opinion Filed Vacating and Remanding for the purpose of a *Franks* Hearing on the marital status issue and an evidentiary hearing on the intrusiveness of the thermal imaging device

IN THE
NINTH CIRCUIT COURT OF APPEALS

Docket # 93-30333

USA,

v.

KYLLO,

Appeal from: District of Oregon (Portland)

DOCKET ENTRIES

DATE	PROCEEDINGS
October 26, 1994	Mandate Issued
November 8, 1996	Notice of Appeal Filed
December 9, 1996	Filed Appellant's Motion for Assignment of Case to Former Panel
January 30, 1997	Order filed denying motion to reconstitute the panel that decided the prior appeal
February 10, 1997	Appellant's brief filed
May 16, 1997	Appellee USA's brief filed
June 16, 1997	Appellant's reply brief filed
November 5, 1997	Oral Argument; Case Submitted to Judges Hawkins, Noonan and Mehrige

DATE	PROCEEDINGS
April 7, 1998	Opinion Filed; Case Reversed And Remanded (by Judge's Mehrige and Noonan; Judge Hawkins dissenting)
May 20, 1998	Appellee USA petition for rehearing with suggestion for rehearing en banc
June 15, 1998	Order filed that Appellant shall respond to petition for rehearing
July 10, 1998	Appellant's response filed to petition for rehearing with suggestion for rehearing en banc
January 12, 1999	Order filed by Judges Brunetti, Noonan and Hawkins that a majority of the panel voted to grant the petition for rehearing. Judge Noonan voted to deny the petition
January 28, 1999	Facsimile filing of Appellant's motion for extension of time in which to file motion for reconsideration
February 5, 1999	Received Appellant's motion to reconsider order of the Court with suggestion for reconsideration of order en Banc

DATE	PROCEEDINGS
February 12, 1999	Filed Appellee USA's opposition to Motion for reconsideration
March 29, 1999	Appellant's reply to Appellee's opposition to motion for reconsideration
April 23, 1999	Order Filed denying motion: Judges Brunetti and Hawkins voted to deny Appellant's Motion for Reconsideration of Order with Suggestion for Reconsideration of Order En Banc. Judge Noonan voted to grant Motion and recommends acceptance of the suggestion for reconsideration of Order En Banc
July 29, 1999	Order Withdrawing the opinion filed April 7, 1998 and appearing at 140 F.3d 1249 (9th Cir. 1998). Panel to decide merits without further argument
September 9, 1999	Opinion Filed: Judgment Affirmed by Judges Hawkins and Brunetti; Judge Noonan dissenting
October 4, 1999	Filed Appellant's petition for rehearing with suggestion for rehearing en banc

DATE	PROCEEDINGS
December 14, 1999	Order denying petition for rehearing with suggestion for rehearing en banc. Judges Brunetti and Hawkins voted to deny the petition. Judge Noonan voted to grant the petition for rehearing and the petition for rehearing en banc.
December 29, 1999	Mandate Issued
March 13, 2000	Notice from Supreme Court of filing of petition for certiorari on March 7, 2000

IN THE
U.S. DISTRICT COURT
FOR THE DISTRICT OF OREGON (PORTLAND)

CRIMINAL DOCKET FOR CASE #: 92-CR-51

USA

v.

Kyllo

DOCKET ENTRIES

DATE	NO.	PROCEEDINGS
January 23, 1992	CR 5	Application and affidavit for search warrant
January 23, 1992	CR 6	Search warrant issued for 878 Rhododendron Dr.
	CR 7	Application and affidavit for search warrant
January 27, 1992		Defendant Danny Kyllo Arrested
January 28, 1992	CR 9	First appearance/ Preliminary/detention Hearing
	CR 11	Order releasing defendant on conditions
February 20, 1992	CR 13	INDICTMENT
February 24, 1992	CR 14	Arraignment
May 18, 1992	CR 30	Motion to Suppress Evidence and for *Franks* Hearing filed

DATE	NO.	PROCEEDINGS
	CR 31	Memorandum in support of motion to suppress
June 1, 1992	CR 34	Response filed by USA to Motion for *Franks* Hearing
June 8, 1992	CR 36	Reply filed to government's Response
June 10, 1992	CR39	ORDER granting in part defendant's Motion for *Franks* Hearing
July 16-17, 1992	CR 43	*Franks* Hearing
Sept. 17, 1992	CR 51	Continuation of *Franks* Hearing
October 20, 1992	CR 55	Defendant's Post Hearing Memorandum Of Law
November 5, 1992	CR 56	Government's Response
Nov. 13, 1992	CR 58	Defendant's Reply
December 4, 1992	CR 59	OPINION denying Motion To Suppress Evidence
March 23, 1993	CR 69-70	Defendant's change of plea
June 1, 1993	CR 73	Sentencing Judgment and Commitment Order
June 9, 1993	CR 75	NOTICE OF APPEAL
June 11, 1993	CR 77	Order Granting Release On Appeal

* * * * *

DATE	NO.	PROCEEDINGS
July 8, 1994	CR 85	Mandate/Judgment REMANDING the matter back to District Court for limited purposes of a *Franks* Hearing on the marital status issue and an evidentiary hearing on thermal imaging device
October 28, 1994	CR 106	Mandate/Judgment VACATING and REMANDING the matter for the purposes of a *Franks* hearing on the Marital status issue and an evidentiary hearing on the intrusiveness of the thermal imaging device. The District Court's ORDER Denying the Motion To Suppress is otherwise AFFIRMED
June 19, 1995	CR 131	Record of evidentiary hearing – Day 1
June 20, 1995	CR 132	Record of evidentiary hearing – Day 2
June 21, 1995	CR 133	Record of evidentiary hearing – Day 3
June 22, 1995	CR 134	Record of evidentiary hearing – Day 4
June 29, 1995	CR 138	Record of evidentiary hearing - Day 5

DATE	NO.	PROCEEDINGS
July 5, 1995	CR 139	Clerk's List of Exhibits and Witnesses
January 22, 1996	CR 161	Defendant's Post-Hearing Memorandum
	CR 162	Appendix to the Post-Hearing Memorandum
February 1, 1992	CR 167	Government's Post-Hearing Brief
February 26, 1992	CR 170	Defendant's Reply
March 15, 1996	CR 172	ORDER denying Motion To Suppress. Updated pre-sentence report requested
	CR 173	OPINION
August 29, 1996	CR 177	Defendant's Motion for Reconsideration of Sentencing Factors
Sept. 29, 1996	CR 179	Hearing on defendant's motion
October 3, 1996	CR 182	ORDER granting Motion For Reconsideration
October 23, 1996	CR 184	Sentencing Hearing
October 25, 1996	CR 185	Sentencing Judgment Order filed
November 8, 1996	CR 187	Entry of Notice of Appeal Filed November 1, 1996
December 20, 1996	CR 196	ORDER granting bail pending appeal

DATE	NO.	PROCEEDINGS
January 5, 2000	CR 199	Mandate/Judgment AFFIRMING the District Court
Sept. 28, 2000	CR 202	Defendant's Motion To Stay Execution Of Sentence
October 10, 2000	CR 205	ORDER granting Motion To Stay Sentence

* * * *

[19] *WILLIAM M. MARTIN*, Government's witness, duly sworn.

THE CLERK: Please state your name for the record and spell your last name.

THE WITNESS: William M. Martin. M-a-r-t-i-n.

[20] *DIRECT EXAMINATION*

BY MR. THOMSON:

Q. What's your present position?

A. I'm the director of sales for Flir Systems Incorporated in Portland, Oregon.

Q. And would you tell the Court what Flir Systems is, please?

A. We manufacture infrared imaging equipment for industry.

Q. Could you tell the Court a little bit about your educational background and your experience that brings you to the position you're in at the present time?

A. I went to Wichita State University in Wichita, Kansas for four years. I went there on a speech scholarship. After Wichita State University I took a job as a corporate pilot. Did that for several years, and then accepted a position in sales with a company that I was flying for at the time.

Q. Which company is that?

A. That is Browning Ferris Industries.

Q. Do they do anything related to thermal imaging?

A. No.

[21] Q. And how long did you stay with B.F.I.?

A. I believe about three years.

Q. Where did you go after your work with B.F.I. was concluded?

A. I went to work for work for a company called Standard Equipment out of Milwaukie, Wisconsin.

Q. And what was your position there?

A. I was a regional sales manager.

Q. Did Standard Equipment Company sell infrared and night vision and thermal equipment?

A. Yes, they did.

Q. And was that your first exposure to the technology involved in the use of thermal imaging devices?

A. Yes, it was.

Q. How long ago was that that you went to work for them?

A. Oh, that would be about 1982.

Q. Did you have some training in—while you were working for that company related to infrared night vision and thermal imaging equipment?

A. Yes.

Q. What type of training?

A. Well, initially, several weeks of training [22] with other members of the team in the technical profession on the equipment and how it was used.

Q. And any additional training while you were with Standard Equipment?

A. Periodic training.

Q. And how long did you work for Standard Equipment Company?

A. About two years.

Q. Where did you next work?

A. Hughes company.

Q. Again would you explain to the Court what your position was there and how it related to thermal imaging equipment?

A. I was the regional sales representative. I worked for a group called the Industrial Products Division, and they concentrated specifically on infrared imaging products. Or I worked, I should say, specifically on infrared imaging products.

Q. What type of products did Hughes have that were infrared imaging products?

A. Their most popular product was known as the Hughes Probeye. They also made the thermal video system and a number of other infrared imaging systems that were specific to different applications.

Q. Did Hughes continue the type of training [23] that you had begun with the Standard Equipment Company?

A. Yeah, I would say they actually expanded it quite a bit. They were very aggressive trainers from a product standpoint, and they have an exceptional reputation, technologically in infrared and in a number of other disciplines. Among the things they had a program they called Probeye University which was a periodic training session in which it was intensive training for a week, and then there was a set of tests after that time period. And if you passed the tests with a 90 percent or higher you were given a certificate from the company itself.

Q. And how long did you work for Hughes?

A. Until -- fundamentally until 1986.

Q. And is that when you went to work for the Agema Corporation?

A. Right. I was actually a manufacturers representative during that initial period so I was self-employed. But my only—the only items that I sold or worked with were infrared imaging products.

Q. And tell the Court a little bit about the Agema Corporation, what do they do?

A. They're also exclusively an infrared imaging company. Their worldwide headquarters are in [24] Stockholm, Sweden, U.S. Headquarters are in New Jersey. A very large and successful company in commercial, industrial infrared image.

Q. Did they provide some specific training in the infrared technology for you?

A. Very much so. Several trips to Sweden as well as continuous sales meetings and training sessions. And they also

had an internal course structure called the 900 Master Training Course which involved essentially a couple weeks over a period of time in Sweden at the factory with their physicist and engineers, again, understanding the equipment and how it works and what its applications are.

Q. And what positions did you hold with Agema?

A. I was the—I was their regional representative initially. I was self-employed. At some point thereafter they asked me to become there western regional sales manager. And I was responsible for all of the territory west of the Mississippi River, Mexico and Canada, which we staffed with about eight to nine manufacturers representatives who reported to me.

Q. And you're currently working for the Flir Corporation. When did that begin?

A. June 13th of last year.

[25] Q. 1994?

A. Right.

Q. During the time that you've been working for the Standard Equipment Company, Hughes, Agema and Flir, have you written inhouse articles for the corporation regarding the thermal imaging technology?

A. Many. Many.

Q. And have you also written at least one article for Trade Journal by the name of Popontics and Spectrum?

A. Yes.

Q. During the course of your employment for these corporations have you had periodic dealings with physicists and scientists dealing with the technology involving infrared imagers?

A. Extensively, yes.

Q. In what way, could you relate that to the Court?

A. For example, one of our primary customers would be NASA's Research Center, or the entire NASA chain. We sell them systems for a variety of applications, one of which is wind tunnel testing which involves some intensive modifications to the system.

Q. Now, have you testified previously in any [26] court as an expert on infrared technology?

A. Yes, I have.

Q. And when was that, and which court?

A. It was, I believe, in District Court in Sacramento, California, and that would be two years ago.

Q. That was a Federal Court as well?

A. I believe it was a Federal Court, yes, I'm not sure.

Q. Can you tell the Court how thermal imagery technology works? Explain it if you can as basically as—so we can all understand it.

A. Essentially infrared imagers are devices that gather infrared radiation. Virtually everything emits infrared. An ice cube emits infrared radiation, a desk emits infrared radiation. The carpet, the lights all of those things emit infrared radiation. Infrared imagers essentially collect that data. When the energy comes to the detector it's converted from infrared radiation into electrical energy, and then that's converted into something that you can see. Either with a TV screen or a phosphorus screen or something along that line. So what you end up in the very basic sense is seeing patterns of infrared radiation that are either emitted or [27] reflected from the surface.

Q. How would you compare infrared to visible lights or x-rays?

A. Well, I wouldn't compare them exactly. They're all part of the electromagnetic spectrum. There's a fairly well-defined tool that's used in science called the electromagnetic spectrum, and it looks very much like a ruler and the different areas of energy are divided into wavelengths. And so visible light is at one portion of the electromagnetic spectrum and infrared is in another portion of the electromagnetic spectrum and x-ray is at a completely other part of the electromagnetic spectrum. But it's fairly well defined in terms of where that is.

Q. In radio waves, ultra-violet waves would also be a part of the electromagnetic spectrum?

A. Would all be a part of the electromagnetic spectrum.

Q. Is there a particular number that scientists use to identify where on the electromagnetic spectrum certain types of energy would be?

A. Yes. For example, infrared, generally speaking, infrared is considered the range from about [28] two microns to about 14 microns on that rule.

Q. And what is it when you're referring to microns, what are we talking about that that's measured?

A. That's measuring essentially the wavelength of the energy which in the case of microns is extremely small.

Q. And that's how we would define where on the electromagnetic spectrum particular waves would fall, is by the wavelength; is that correct?

A. That's correct.

Q. Can you see infrared energy with the naked eye?

A. No.

Q. Is there ever any time when you see evidence of infrared energy with the naked eye?

A. There are times when objects become molten, when they finally get so hot that they're burning. You're -- they're creating light but you're also essentially seeing some level of infrared radiation. That's the point where the two co-relate.

Q. How would you describe if it fits here at all when it appears that you see heat rising from, let's say, an asphalt highway?

A. I think what you see in most of those cases [29] is just the—is a distortion in the air where the air current is much warmer relative to the air that's surrounding it.

Q. Now, in order to take an infrared image what exactly is needed?

A. Well, in the types of systems that are most widely used, typically you need a lens that's transmissive of infrared radiation, you need a detector that's sensitive to the wave-

length that you're interested in looking at, you need a way of converting the energy that the detector receives in infrared into visible light and then a way of displaying that.

Q. Is there anything about the infrared imaging technology that is—that emits any type of rays or sounds or anything of that nature?

A. No. Infrared is truly a passive technology. Like any electrical device, you know, it makes some sound when you turn it on, those kinds of things. But, no, in terms of sending any wavelength out and then receiving it like sonar, no, it doesn't do anything like that.

Q. How would you compare an infrared imager to a normal camera that takes photographs?

A. Well, they're similar somewhat. The real [30] primary difference is that a normal camera operates in the visible light range. So whether it's a photographic camera or a video camera that's visible, you know, the lenses, the detector or the tube or the film is specifically designed to collect energy in the visible range. Infrared imagers work similarly in many ways, but they're designed to collect information that is impinged on the detector in the infrared.

Q. Are you familiar with an Agema product known as the Agema 210?

A. Yes, I am.

Q. And that being sold by the Agema Corporation when you were working there?

A. Yes, it was.

Q. And some of the training that you have, did it relate specifically to that particular device?

A. Yes, it did.

Q. Could you explain to the Court how that infrared imager works?

A. It has a group or a row of infrared detectors and there is a mirror inside that basically sweeps from side to side to fill the field of view, if you will, with the information from those detectors. And then it produces a screen basically [31] much

like a video screen in which hot things are white and cold things are black and everything in between is differentiating in shades of gray.

Q. I'd like to show you Agema 210 that I brought to the Court with us. I'm not going to mark it as an exhibit. Does this appear to be a 210?

A. Yes, that's a 210.

Q. And can you tell the Court how readily available to the public is a machine like this?

A. Very, very, very readily. Readily available. The 210 is one of—and I don't know the exact manufacturing numbers, but it's probably close to 750 to a thousand systems have been produced. Its predecessor the 110, there were something in the neighborhood of four to 5,000 units produced. Hughes competitive product that we talked about was made in the range of five to 6,000 units. Anyone can essentially pick up the phone and dial 1-800-G-E-Rent and rent an infrared imaging system like the 210 or a number of other infrared imagers. There are probably half a dozen national companies that rent infrared imaging equipment.

Q. Now, looking at the camera I brought here—I'm going to unplug this for one second—what's plugged in is what?

[32] A. Battery.

Q. It's a battery so we don't have to plug it in?

A. Right.

Q. Okay. I'm going to unplug that for a moment. Well, I guess I'll just leave it on. It probably won't work if I unplug it. What I want to have you do, and if—

MR. THOMSON: With the Court's permission, Your Honor, I would like the witness to be able to approach so the Court can see the controls on the machine. I would just like you to turn this on and show which controls are used and what they do, and then we'll put it on the monitor so that we can all see it.

THE WITNESS: Okay.

Q. First I'd like to—

MR. THOMSON: With the Court's permission, Your Honor, is that acceptable?

THE COURT: Yes. That's fine.

MR. LERNER: May I approach?

THE COURT: You may step forward. See what he's showing me.

THE WITNESS: If you look at the back they're really, the primary controls are focus which [33] works just like the focus on the camera. Then you have brightness and contrast which works very much like the brightness and contrast on the television. The idea is to use these controls to adjust the image so you get the optimum picture quality, and that varies somewhat with the temperature of the object and what you're looking at. There's a screen here. Polarity invert, I mentioned earlier, white is typically hot and black is typically cold. Polarity invert changed that around. Black is hot and white is cold. There are a few applications where that's required. And then a power switch and a video out and that essentially represents the camera.

BY MR. THOMSON:

Q. Could you turn it on?

A. Sure.

Q. And then perhaps could the Court just look through it so you could see what kind of an image—

A. Let me take just a second and I'll go ahead and point it in this direction. It's very sensitive to focus so hold, yeah, your thumb right there. Focus.

THE COURT: Where do you want me to look?

THE WITNESS: Just right here. You might try to focus it a little bit. What you'll see is a [34] sharp picture. His glasses will appear to be dark. Do you see it yet?

THE COURT: Oh, yes.

THE WITNESS: You can focus in and out just a little bit. And see how that changes the picture?

THE COURT: Uh-huh. Okay.

THE WITNESS: Okay.
THE COURT: Yeah.
MR. LERNER: May I?
THE COURT: Yes.
MR. THOMSON: Why don't you retake the witness stand, please, and I'll hook this up to the monitor.
THE WITNESS: Okay.
THE COURT: Counsel, I do have a verdict so I'm going to break at five till.
MR. THOMSON: Thank you, Your Honor. You're going to break at five till?
THE COURT: I'll break at five till 11:00 because the lawyers aren't here yet.

BY MR. THOMSON:

Q. Before we show what is being shown on the monitor, can you explain to the Court why, as you said, when she looked at counsel's glasses they appear dark as opposed to any other color?

[35] A. Well, body is fairly warm and radiates energy fairly strongly so his face is going to be stronger than his suit or the background which is—skin temperature is effectively going to be somewhere between 84 and 92 degrees Fahrenheit on the outside, so that's going to be a little bit more—his glasses are closer to room temperature, and they aren't very transmissive of infrared radiation so they appear black because they're much cooler than the surface that you see on the screen.

Q. Now, you raised an estimated temperature, for example, about skin temperature. Does the Agema 210 in any way provide any information about how warm the items that it is collecting information about are?

A. It doesn't provide any specific temperature measurement at all.

Q. All right. So what is it actually measuring?

A. It's just measuring the amount of radiation that's impinged on the detector.

Q. And the contrast between the items, what does it show you then?

A. It just shows you relative radiation differences. Now, the system is repeatable but it's [36] not a measurement tool.

Q. So basically when you see something that's dark it's going to be cooler than the items that are lights?

A. Right.

Q. Without saying how cool or how hot?

A. How hot it is typically, yes.

Q. (Pause) We seem to have a problem.

A. Is it on?

Q. Is the machine on? The Agema is on, yes?

A. Power is on?

Q. Appears that we have a --

THE WITNESS: May I look at it, Your Honor.
THE COURT: Yes. Go ahead.
MR. THOMSON: I need your help. Thank you.

(Discussion held off the record.)

MR. THOMSON: Perhaps we can try to correct this while the Court takes its verdict, and we'll get back to this part, Your Honor.
THE COURT: All right. Then I'll recess.
MR. THOMSON: We're having technical difficulty.
THE COURT: I'll recess court at this time.
THE CLERK: Court's in recess.

(Recess)

[37] THE CLERK: Court is now in session.
MR. THOMSON: May I proceed, Your Honor?
THE COURT: Yes, you may.
BY MR. THOMSON:

Q. Mr. Martin, before we ran into the technical difficulties, I was about to demonstrate for the Court some of the information that could be seen with the Agema 210. We've now plugged this into the monitor and does this give an accurate image as to what you see through the view finder when you look at the monitor?

A. Yes, it does.

Q. All right. So now that I've turned this on, what we're seeing is what is appearing in the view finder?

A. Yes. Exactly.

Q. And I'm going to just use this a little bit so the Court can see what we're looking at here.

MR. LERNER: Excuse me. Counselor's in the way so we can't see.

MR. THOMSON: I'll see if I can turn this so I won't be in the way.

Can you see that now?

BY MR. THOMSON:

Q. In the monitor can you describe for the Court what factors of the infrared [38] imagery you can see in the inset I'm showing right now?

A. Okay. The image that was there is a person. You can see that the glasses are cooled, the face is very warm, the clothing, which is acting somewhat as an insulator, is a little bit less warm. You can see a number of the pews or chairs and people standing in those locations. Somebody just crossed their arms in the back. Just a fairly straightforward infrared picture.

Q. Now, can you tell the Court, is it possible to take a reading through a normal wall such as buildings are or normally constructed?

A. No.

Q. And so if we were to point this at a wall, what is it that we would see? And I'll just point it at the wall that's straight across from me at this point in time. What is it that we're seeing?

A. You're seeing a combination of what is emitted from the wall itself and what is reflected by the wall.

Q. And is there anything that we're seeing that would be on the inside of that wall?

A. No.

Q. When I point it then instead at the jury [39] box, what are we looking at now?

A. Just the individuals in the chairs there. You may want to focus just slightly. There you go.

Q. Now, if a person were to be in view in the thermal imaging device and were to leave the room would you expect that we would be able to see them after they left the room?

A. Absolutely not.

MR. THOMSON: Your Honor, just for the purposes of demonstration I would like to use Mr. Elliott, my case agent here, and focus on him and have him leave the room and close the door so the Court can see the principle that we're trying to describe here.

THE COURT: All right. Go ahead.

BY MR. THOMSON:

Q. And even though we can still see Mr. Elliott through the glass, we can't see him with the thermal imaging device, can you?

A. No.

Q. So what exactly is it that the thermal imaging device, this Agema 210, is measuring as we're looking through it?

A. It's measuring the amounts of radiation that is impinged on or detected by the detector.

Q. Can you give the Court some idea how long [40] the Agema 210 has been on the market, and whether or not there are more sophisticated thermal imagers out there on the market now?

A. The 210, I believe, has been on the market about four years. There are significantly more sophisticated systems on the market. There are some less sophisticated systems on the market as well.

Q. And I'm going to backtrack for just a moment. I asked you if you—with the thermal imager we could see through a wall or through the normal construction materials that walls are made of. Are there some kinds of materials that, and I put this in quotes, we could see through with the thermal imager?

A. There are some—some things that you could see through with the thermal imager. Just—

Q. And when we say "see through", can you explain, I'm using that in the common term, is there a scientific explanation that relates to the electromagnetic spectrum that you would use, how would you describe that?

A. We normally describe it as being transmissive of infrared radiation which means that instead of absorbing or reflecting, it essentially allows the radiation to pass with a slight or small [41] attenuation.

Q. And what types of materials would have such a high degree of transmission that it would appear that we were seeing through them?

A. Common material would be something like a Glad trash bag, a black garden variety trash bag. There are a lot of exotic materials that are made specifically for the purpose of creating infrared lenses or filters and they would be things like sapphire or germanium that are also highly transmissive of infrared radiation.

Q. You mentioned germanium, is that what the lens for the Agema 210 is made of?

A. I believe it's lead selenide.

Q. Why couldn't we use just ordinary glass like we would use for a camera lens?

A. Because glass has very low transmission of infrared in the band that the 210 operates.

Q. If we were, for example, to have a house that were constructed of Glad trash bags you might be able to see what was going on inside?

A. Yes.

Q. And if you can explain that phenomenon, why would that be so?

A. Just the material is very transmissive and [42] it's very much like looking through a lens or an I R transparent window. If you built a structure of plastic, Glad plastic or something along that line, you would probably be able to see things behind it.

Q. Depending on the thickness, that sort of thing?

A. Yes, most likely.

Q. But the normal construction materials such as lath and plaster or plasterboard or stucco, would you be able to see through those?

A. No.

Q. What about something like tin that quonset huts are made of, would that be so transmissive that we would be able to see things inside?

A. You cannot see through tin. Tin however like most metals absorb and reradiates very quickly. So if you placed a hot object directly against tin it would absorb the energy and reradiate it on the other side where you might be able to see something.

Q. That's because it would be in contact with?

A. Right.

Q. Now, you mentioned that there are more sophisticated thermal imagers available on the market now. Does your company make one of those?

A. Yes, we do.

[43] Q. And what's it called?

A. The Prism.

Q. You brought one of those with you to court today?

A. Yes, I did.

Q. And how is Prism infrared imager different from the Agema 210?

A. As I mentioned earlier, the Agema 210 employees 48 detectors, I didn't mention 48, but a row of detectors that is scanned horizontally. The Prism uses what's called focal plane array which is—there are no mirrors or scanning surfaces inside. It's just a detector that is comprised of 320 horizontal pixels by 244 infrared lines.

Q. How does the result differ from what we saw on the 210?

A. Principally the image for any given field of view is going to be much more detailed. The resolution is higher.

Q. Now, even though the resolution is higher, does that mean—let me strike that. Because the resolution is higher, does that mean we could then see through walls?

A. No.

Q. Does that change the technology at all of [44] the thermal imager?

A. No.

Q. So basically what we're getting is a clearer picture of the thermal image; is that correct?

A. That's correct.

Q. And are there more sophisticated devices than the Prism infrared imager on the market?

A. There are a few. However, I would say the Prism probably represents the best widely available technology.

Q. And I would like to have the Court see the difference as far as the image is concerned and it takes just a moment to plug the other device in, I believe.

THE COURT: And Mr. Hingson and Mr. Kyllo, if you want to move over there so you can see—

MR. HINGSON: Thank you, Your Honor.

BY MR. THOMSON:

Q. The device that I'm holding now is the Prism that you indicated has a more sophisticated way of making the image clear?

A. Uh-huh. You might check your finger, looks like it might be on the store button.

Q. Okay.

A. Okay, there you go.

[45] Q. So is the image I'm seeing now on the monitor what I would be seeing through the lens—I mean through the eyepiece that I'm looking at?

A. Yes. The only difference is that we're currently displaying a color image where it's black and white through the viewfinder.

Q. And I'd like to do the same demonstration that we did with Mr. Elliott, if I could get Mr. Elliott to stand and walk out of the courtroom.

(Mr. Elliott complying)

Again, we're not able to see him outside the courtroom. Is that right?

A. That's correct.

Q. All right. And you can still see him through the glass outside the courtroom?

A. Yes, you can.

Q. Could I have you come over here and turn this off. We don't need to have it running for us any longer.

A. Sure.

Q. Mr. Martin, in your opinion being familiar with the various thermal imaging devices that are available on the market, are there any devices that are capable of seeing through ordinary building walls?

[46] A. No.

Q. This Court earlier had an affidavit before it that was also presented to the Court of Appeals from a person who's not going to be a witness, but this is some evidence that was presented previously of another person's opinion, that given enough time and watching a building that you could tell intimate details going on inside such as a person having sexual intercourse inside that building. What's your opinion of that?

A. It's not possible.

Q. Now, are you familiar with how the Agema 210 is being used to detect marijuana grows?

A. I'm familiar that it is being used to detect marijuana grows, yes.

Q. And in your opinion could an operator of an Agema 210 ever say just on the basis of a thermal imaging reading that there was a marijuana grow present inside a particular building?

A. No.

Q. What's the most that could be said from the reading from a 210?

A. The most that could be said is that there's a thermal variance, a thermal anomaly, something that looks different than other things in the field of [47] view.

Q. And if you could just explain what you mean by a thermal anomaly?

A. Generally an infrared, regardless of the application, the operator is looking for something that varies from a perception of something he's seen before. So if the application is to look at electrical connections, he may look at three connections in a row and what he's really interested in is to find one that looks significantly different than the other two and that gives him justification to evaluate it further. Everything really in infrared boils down to trying to find or define a thermal variation, and the differences really are to what extent you try to quantify that variation. Whether you're going to measure it for temperature, et cetera.

Q. Now, if what you're looking for is a thermal variation, would it be important in an application such as trying to detect marijuana grows to know how hot precisely the reading is that you're getting?

A. Generally speaking, when you talk about thermal anomalies, regardless of the application, the first question is not how hot, just that the anomaly [48] exists.

Q. Now, what conditions would you expect to be present in order to get an accurate reading of a thermal anomaly on the outside of a building?

A. Well, you'd want to have a relatively consistent ambient condition, you'd want to eliminate things that might confuse the operator like solar reflections or other objects in the field of view. You'd want to have a good reference or references so that you can make—you can distinguish between what looks or you perceive to look as normal versus something that appears to be an anomaly.

Q. And what time of the day, if there is an optimum time of the day, would you recommend that a reading be taken on the outside of a building?

A. I would recommend very late at night, early morning hours.

Q. And if you could explain that for the Court why that would be important?

A. There are a number of things that happen from an infrared standpoint. Ideally you want to see just the radiation from the structure itself and nothing that is introduced externally.

Q. And that would happen if you gave the building enough time to cool off after dark, is that [49] what you're saying?

A. That's correct.

Q. And would you want to have some buildings to compare to?

A. That would be ideal, yes.

Q. And anything else that you would, besides the time of day and buildings to compare it with, anything else that you would expect for there to be?

A. Well, you'd want the buildings to be relatively consistent from a materials standpoint. You'd want to keep a relatively fixed distance although it's fairly tolerant of distance, to try to make the comparison as much apples and apples as is possible.

Q. Now, in this particular case, have you had an opportunity to view the videotape that was made on January 16th of 1992 of the defendant's residence?

A. I have.

MR. THOMSON: And, Your Honor, just for the record, we'd mark that as Government's Exhibit No. 2 for identification. I'm not going to show it at this time but you did see that videotape?

THE WITNESS: Yes, I did.

THE COURT: Mr. Thomson, I need to—our [50] chief Judge Hogan is in Eugene and I'm going to chair the judges' meeting today because he's not going to coming up. So I need to recess right now for the lunch so I can get ready for that. And we will reconvene then at 1:30.

MR. THOMSON: All right. Thank you, Your Honor.

(Recess)

THE CLERK: Court is now in session.

MR. THOMSON: May I proceed, Your Honor?

THE COURT: Yes, you may.

MR. LERNER: Your Honor, before we get too far along here, I don't think the Government -- the Government has been eliciting a lot of opinions from this witness and we have kind of been letting it go by, although they did not stop after their qualification of him. They ask the Court to find that he's an expert or to specify the area of expertise that he's being asked about. I'd like to have some understanding what is this witness' area of expertise and what is he capable of giving opinions about and what is he not.

MR. THOMSON: Your Honor, I didn't think it was necessary to ask the Court to find that he's an expert but I will ask the Court to do so at this [51] time, and I believe that he is qualified as an expert to testify about thermal imagery and thermal imagery devices.

THE COURT: All right. I will make that finding that he is—has sufficient knowledge and background in, thermal imaging to be of assistance to the Court as an expert witness.

MR. THOMSON: Thank you, Your Honor.

BY MR. THOMSON:

Q. Mr. Martin, just before we took our recess this morning I asked you if you had an opportunity to look at the videotape which is Government's Exhibit No. 1 and a diagram and some photographs which are marked as Government's Exhibit No. 2, No. 3A, 4A and 4B.

MR. THOMSON: Your Honor, I have provided for the Court a smaller copy of these photographs that are marked as 3B, 4B and 5B.

THE COURT: All right.

MR. THOMSON: And I realize that these exhibits have not been admitted yet. I would ask the Court to allow me to proceed with these and I will tie them up with another witness.

THE COURT: Any objection to that, Mr. Lerner?

MR. LERNER: No, Your Honor.

[52] THE COURT: All right. You may proceed.

25 BY MR. THOMSON:

Q. Mr. Martin, in examining the videotape recording that was made of the thermal imagery that was done in this case and comparing it to the diagram, Government's Exhibit No. 2, did you find that the—that the videotape showed the same hot spots that are shown on this diagram?

A. Yes, I did.

Q. And in particular, referring to Government's Exhibit No. 2, there appears to be three buildings and the hot spots are on the roof, on the left hand part of this diagram of the center.

MR. LERNER: Your Honor, I object to the nature of the leading question. Have the witness describe what he's describing rather than the U.S. Attorney testifying.

MR. THOMSON: I'm just trying to make the record clear, Your Honor.

THE COURT: All right. Well, I'll sustain the objection to that question.

BY MR. THOMSON:

Q. Could you describe verbally where the hot spots are shown on this diagram starting with the three buildings on the left so that we have it in the record?

A. Well, from the angle I'm sitting right now [53] it's in the center.

THE COURT: Counsel, if cant' see it he can step down.

THE WITNESS: I can see it fine. It's the center or the middle of the three structures on the left-hand side. The roof and what is visible of the side wall.

BY MR. THOMSON:

Q. And how is that—how's the hot spots, how are they depicted on this diagram?

A. Well, as we mentioned earlier, they show up as white or very, very light gray, and they essentially fill that area that's on the left-hand side, the roof, part of the eave and part of the side wall.

Q. There are some slash lines that are shown on this diagram. Are those what—are those roughly where you saw the videotape?

A. That approximates very close, yes.

Q. And this diagram also indicates pot with some lines pointed to those?

A. Right.

Q. Then directing your attention to the second set of three buildings, can you tell us where this diagram shows the hot spots on this part of the diagram?

[54] A. It shows it on the right-hand side wall, the vent, which is just underneath the crust of the roof there, and then a couple of the other roof vents were quite warm comparatively speaking.

Q. Just so the record is clear, it appears that the far side of the center building has some shading. Is that where you're talking about, the hot spots showing up on the videotape recording?

A. Yes, it does.

Q. And it's even darker spots here where the diagram indicates vent and very warm?

A. Right. Looks like a roof vent.

Q. And then the other place or the other area you're talking about is up in the center part of this roof of the center building?

A. Uh-huh.

Q. Was that a yes?

A. That's a yes. I'm sorry.

Q. Thank you. Now, I have some photographs that you've also looked at these, does this Exhibit No. 3A correspond to a view of the three buildings on the left-hand part of the diagram?

A. Yes, it does.

Q. And so on this photograph we would be looking again at the center building that's shown in [55] the center of the photograph?

A. Right.

Q. And the information you saw on the thermal imagery would then show up on the roof in this area depicted on the diagram?

A. Right. The upper left-hand corner of that—

Q. The area that I'm indicating with the pointer now?

A. Right.

Q. And does photograph No. 4A show the view that's depicted in the right-hand part of this diagram?

A. Yes, it does.

Q. Again, we would go looking down at the center building and the area that's shown on the far end of the building would be the area that's here at the end of this building in the center; is that correct?

A. That's the side wall and you can see, I think, just a little bit of the vent, maybe an attic vent there.

Q. This would be the attic vent that you're talking about here?

A. Right.

[56] Q. Then the other area that's shown as being hot would be the vents that are here on the roof?

A. The roof vents, right.

Q. All right. Now, after having looked at the videotape, the photographs and the diagram, do you have an opinion as to whether or not that videotape shows a thermal anomaly at the time that it was taken on January 16th of 1992?

A. Yes, I believe it does.

Q. And that would be in the area that's depicted on the diagram that we were pointing to on the photograph?

A. Yes, it does.

Q. Now, what does that mean to you when you say it shows a thermal anomaly?

A. It means it shows a temperature pattern that is somewhat different or significantly different than those in the houses adjacent to it. It differs from your expectation of the thermal pattern for that kind of a structure.

Q. Now, what significance does it have in this case that we have the three buildings that are right next to each other as shown?

A. In most thermal imaging applications you would certainly like to have like structures or like [57] targets in the field of view. It helps to make the comparison more valid. If the other structures were made of significantly different material or were at different distances, that would impact the findings.

Q. The Agema 210, is it possible to manipulate that machine in order to produce the kind of thermal anomaly that you observed in the videotape?

A. I do not believe so, no.

MR. THOMSON: I have no other questions for this witness, Your Honor.

THE COURT: Okay. And you may inquire.

MR. HINGSON: Thank you, Your Honor.

CROSS-EXAMINATION

BY MR. HINGSON:

Q. You're a graduate of Wichita State University?

A. I'm not a graduate.

Q. What did you study there?

A. Speech, communications.

Q. Did you take any science classes?

A. Some.

Q. Which ones?

A. Algebra, applied physics.

[58] Q. Can you explain to Judge Frye what the scientific method is?

A. No.

Q. Have you ever heard of it?

A. No.

Q. Do you know what the term "replication" means?

A. I have an idea.

Q. Within the context of subjecting scientific studies to the crucible of peer review, do you have an idea?

A. No. None whatsoever.

Q. Do you understand what the term "accuracy" means as it relates to the scientific method?

A. No.

Q. Do you have an understanding as to what the term "precision" means when it relates to the scientific method?

A. I certainly understand what the terms "accuracy and "precision" mean but not necessarily in the context of scientific method.

Q. Have you ever conducted any scientific research of yourself?

A. No, I haven't.

Q. I should say by yourself, I'm sorry.

[59] A. Neither.

Q. Further advance training you had, it was in what area?

A. Application principally in product issues.

Q. Essentially on-the-job training?
A. Yes. On the job training.

* * * *

[64] Q. I see. What was the name of the case that you testified in in Sacramento?
A. I don't remember.
Q. How much does an Agema 210 cost?
A. I believe when I left Agema it was $20,000.
Q. And how much does a Prism cost?
A. Between $32,000 and $47,000 depending on its configuration. The model we demonstrated here today is 48—47,950.
Q. So when you said that they were—that these types of machines were available to the general public, you meant to the general public with big bank accounts?
A. The rental market which is what I was alluding to, you can rent an infrared imager for as little as a thousand dollars for several weeks. So certainly to purchase it requires a significant amount of cash. To obtain one for, you know, a week or two weeks or a month doesn't.

* * * *

[67] Q. These devices, these infrared devices initially began to be used as part of our warfare, correct?
A. Correct.
Q. Now, let me switch gears if I could just a little bit. When you use the term non-invasive in describing infrared technology, what you meant is that the device itself does not invade, right?
A. Right.
Q. In other words, it doesn't reach into my pockets?
A. Yes, sir.
Q. But what it does do, it sees what this eye cannot see, correct?
A. True.

Q. And it detects the undetectable?
[68] A. It sees what your eye cannot see.
Q. And what your ear cannot hear?
A. True.
Q. And what your tongue cannot taste?
A. True.
Q. And what your nose cannot smell?
A. (Nods head)
Q. And what your skin cannot feel? Unless you get real close.
A. Yeah. Unless you get real close.
Q. Okay. You're testifying in this case for a fee?
A. No.
Q. You're testifying in this case for free?
A. Yes.
Q. A ruling in this case in favor of the defense, if it was accepted throughout the United States of America, would cause some economic harm to the infrared technology sellers, correct?
A. To some, yes. Very, very little to Flir Systems.
Q. When you get into the technical area of the infrared device in your sales a lot of times you get asked questions you don't know the answer to, right?
A. In some cases, yes.
[69] Q. And you have to rely upon the technical support people of the infrared manufacturing firm whether it's Agema or Flir, right?
A. Absolutely.
Q. And those people are generally degreed engineers?
A. Many of them, yes.
Q. Flir is based here in Portland, right?
A. Yes.
Q. And this is where you call home now?
A. Yes, sir.
Q. Okay. And you have to leave for Europe tomorrow?

A. No. I'm back from Europe. I have to leave for Dallas tomorrow.

Q. Okay. Now, one thing that you mentioned in your direct testimony caught my attention. You were talking about the—of the various infrared devices that are available to the public. I kind of think like a pancake at times, I like to turn things over, and let me turn the question over. Are there infrared devices that are manufactured in the world that are not available to the general public?

A. Not—in the world, certainly.

[70] Q. The manufacture of the most sensitive infrared device is in Japan, correct?

A. No, I don't believe that's true.

Q. Where would you say they manufacture the most sensitive, sensitive device is?

A. In the United States.

Q. Who's that manufacturer?

A. It could be a couple of different manufacturers, but my impression is, and this is my impression, is the technology leadership is here.

Q. Now, who are those manufacturers?

A. Texas Instruments, Hughes Aircraft Company, Honeywell.

Q. Can you kind of revisit the technical sensitivity of the machines that we've seen here today and compare to contrast them with the machines that you're talking about?

A. Yes, I can. The 210 would be described as a mid-resolution system. It produces an image that effectively has 168 horizontal pixels by 96 infrared lines.

Q. 168 by 96?

A. By 96.

Q. Okay.

A. The Prism would be considered a high [71] resolution infrared imaging system and it produces an image that has 320 pixels horizontally by 244 IR lines. There are systems that are available that have resolution as high as a thousand

pixels by a thousand lines? And by available I mean they've been built in test situations or in research projects.

Q. The ones that are a thousand by a thousand, are they generally available to the public?

A. They could be. Many of them are export or D.O.D restricted, but there are 1,000 by 1,000 pixel systems that are available to the public at a price.

Q. Now when you said D.O.D, you meant Department of Defense, didn't you?

A. Yes, I did.

Q. And you know that there's a representative of the Department of Defense here?

A. Uh-huh.

Q. The answers yes?

A. I believe there is, yes.

Q. All right. Now, are you aware that the resolution of machines manufactured in Japan have a resolution of 2,080 by 2,080?

A. I don't have any reason to doubt that.

* * * *

[74] BY MR. HINGSON:

Q. Are you aware of any scientific literature that has been published that addresses the issue of the potential rate of error in using infrared devices to detect the presence of marijuana growing operations?

A. No.

Q. Are you aware of any existence and maintenance of standards governing the use of infrared technology to discover marijuana growing operations?

A. I don't know of a standard, no. I know there's significant training that's produced by the Drug Enforcement Administration.

MR. HINGSON: Your Honor, I'd like to turn the further interrogation over to Mr. Lerner now.

THE COURT: All right. Go ahead.

MR. LERNER: Thank you.

BY MR. LERNER:

Q. Mr. Martin, I'd like to pick up on that topic there. Are there any independent federal agencies, not law enforcement agencies, that regulate the thermal imaging industry?

A. No. If I understand your question, no, I [75] don't believe so.

Q. Nothing like the Federal Trade Commission or the—

A. Just the normal manufacturing F.T.C. and that sort of thing, right.

Q. Are there any national performance standards for thermal imaging equipment that guarantees how effectively they have to operate? I'm referring to sort of like the automobile industry has crash tests and things like that that make them crash worthy for the American public. Are there similar types of proficiency requirements that the Federal Government requires?

A. Not that I know of from the Federal Government, no.

Q. Do you know of any requirements that infrared equipment be tested by any independent group before it can go on the market?

A. Not a requirement, no.

Q. Are there uniform industry standards that are published that require a particular performance level be adhered to?

A. No. You mean the market effectively determines that—

Q. So bad machines don't get bought?

[76] A. They don't get bought, yeah.

Q. Are there any studies that you are aware of that discuss the reliability of using thermal imaging in this type of operation searching for marijuana grows?

A. Not that I know of.

Q. Do you know how long thermal imaging has been—equipment has been used in searching for indoor marijuana growing?

A. I don't.

Q. Are there any studies that you know of that test how hot a roof should get if it has a halide light that has been burning underneath the roof for a given amount of time?

A. Not that I know of, no.

Q. It's possible though to actually test to make precise measurements with some thermal imaging devices?

A. Yes, it is.

Q. The Flir that you have here actually measures precise actual temperature, doesn't it?

A. It does.

Q. The Agema does not do that?

A. The 210 is not a measurement device.

Q. So it is possible to do laboratory studies [77] to determine how hot a given material might get if it's subjected to halide lights for a given amount of time?

A. It's possible to do tests to determine temperatures, yes.

Q. But still, as I understand your testimony, there would be a lot of variables out in the real world?

A. A lot of variables, yes, sir.

Q. Temperature can make a difference, correct?

A. Ambient temperature.

Q. Ambient temperature, moisture in the atmosphere; is that correct?

A. It can make a difference.

Q. Cloud cover or lack of cloud cover?

A. Yes.

Q. Solar exposure to the sun you were talking about?

A. Yes.

Q. All of those things can have an affect?

A. Yes, they can.

Q. If there were such studies about the reliability of thermal imaging for discovering marijuana growing, where would those studies be published?

[78] A. There's several places they could in theory be published. Society of Professional Industrial Engineering holds seminars specifically related to infrared imaging.

Q. That's a reputable organization, society—
A. Yes.
Q. That's—goes by the acronym S.P.I.E?
A. Right.
Q. S.P.I.E?
A. It's a trade group association, right.
Q. And the information that they put out is fairly well disseminated in the scientific community?
A. Well, disseminated, certainly it's variable depending on who authors it but it's widely disseminated.
Q. And some would be more cutting-edge applications are often discussed by this publication?
A. Often, yes.
Q. I believe that actually—well, I'll take back what I believe. But isn't it true that infrared, the applications of infrared technology are basically limitless?
A. It seems to be very broad.
Q. I was reading a publication that the Government supplied which actually says that the [79] applications of thermal imaging are virtually limitless, just really limited by human imagination and technological refinement, right?
A. Yes. It's a very broad, very, very broad statement.
Q. It's fair to say that the infrared industry is in a constant state of refinement and technological advances; is that correct?
A. That's correct.
Q. And spatial resolution is getting better and better all the time?
A. Better and better.
Q. When you're talking about all these thousand by a thousand, you're really talking about the ability of the infrared imager to make a more precise picture; is that right?
A. A clearer, more precise picture, yes.
Q. That's what they mean when they say "spatial resolution?"
A. Generally, yes.

Q. It means how small a space this thermal imager can pick-up, correct?
A. Correct. Or how small of a target it can define.
Q. That's right. And the big one's, [80] a thousand by a thousand or the 2,080 by 2,080, they can from a satellite pick up a very small target; isn't that correct?
A. I'm not sure what size of target they could pick up but the more pixels in a given field of view the more detailed that you can achieve. Just like visible—
Q. So you're not expert on how refined the detail can get?
A. Not from a satellite system, no.
Q. How about from navigable air space that an Army jet might find?
A. Well, you can certainly determine how big of a spot would be observed based on the resolution of the camera.
Q. Well, could the technology of 2,000 by 2,000 array, focal plane array get details within an inch or two?
A. It would depend on the field of view of the lens. If you had a narrow field of view that is, I think possible.
Q. Is it possible to a couple computers in computer enhancement with the thermal imagers producing?
A. It's possible, yes, sir.
[81] Q. Are you aware of all of the Agema internal testing procedures?
A. I'm aware of most of them, yes.
Q. Would you say that their operation is as rigorous as Flir's?
A. I would say they're similar.
Q. Would you say there as rigorous as Flir's?
A. Yes, I would. I would say it was rigorous as Flir's.
Q. Do you know what quality assurance procedures they have at Agema?
A. For measurement or for—
Q. Failure rate.

A. I'm not sure about failure rate. They certainly keep track of the numbers of units that are delivered to the field and what there return rates of those units are.

Q. Well, what is the failure rate off a production line at Agema; do you know that?

A. I don't know that.

Q. When you were talking a little bit back about the ability of the Flir to actually detect an absolute temperature where the Agema does not do that. And the terminology that I have read is that the ability to actually detect a particular [82] temperature is a quantitative system.

A. Right.

Q. Is that right?

A. That's correct.

Q. It can quantify the temperature of an object by looking at it?

A. Right.

Q. Whereas the Agema is called a qualitative system?

A. Right.

Q. How would you compare the Flir and the Agema?

A. Just generally?

Q. Yes.

A. I would say the Flir has a much better picture. Picture quality is better.

Q. More precise?

A. Much more detailed. More precise and it includes measurement capability.

Q. More technologically advanced?

A. Certainly.

Q. A very different machine?

A. They are.

Q. And you said during your testimony that when you were at Hughes they manufactured a lot of [83] different machines with different applications?

A. Yes, sir.

Q. So there are more than these two types of machines, correct?

A. Many more.

Q. How many more?

A. In terms of brands or vendors?

Q. Vendors and subcategories within the vendors?

A. I would be hazarding a guess, but I would say 35, 40.

Q. And each one of those machines have different capabilities and may actually not be able to do the same things, all of them?

A. There are differences and similarities I'm sure between those systems, yes.

Q. Is it possible that two different thermal imagers will get two different images of the same target?

A. It's possible that they could look differently, yes.

Q. Now, I'd like to talk with you a little bit about the Agema system, the qualitative system we're talking about.

A. Uh-huh.

[84] Q. Is there—you said it's not an objective measuring device—

A. Right.

Q. —correct? So it's really not a scientific instrument in that respect?

A. I said it's not a measurement device. I wouldn't say that it's not a scientific instrument.

Q. It's not a scientific measuring device. And it is not preset to any particular ambient temperature, is it?

A. The temperature is cooled so the detector itself is set to a specific temperature.

Q. What is that temperature?

A. I believe it's minus 70 C.

Q. Is there any internal mechanism that tells the operator what the grades of temperature are?

A. No.

Q. Any internal reference point that actually says this is let's say 75 degrees and you can go from there?

A. No.

Q. So it's not possible to say how hot the white is and how cold the dark is?

A. No, it's not possible.

Q. You did some clarification about the [85] principals of infrared technology. I'd like to talk to you a little bit about that. As I understand it what we're really talking about in this electromagnetic scale is really light waves and sounds rights; is that correct?

A. Energy wavelength.

Q. Energy wavelength. Basically everything is moving at the speed of light or the speed of sound; is that right?

A. I don't believe that's true.

Q. You don't?

A. No.

Q. All of these wavelengths, are they moving at the same speed or not?

A. No.

Q. So they're moving at different speeds and have different wave lengths, is that your testimony?

A. I believe so.

Q. Are you sure?

A. I'm not sure.

Q. So if you don't know the answer to something would you just tell us you don't know the answer to that?

A. I'd be delighted.

Q. Can you tell us what is on the extreme side [86] of the visible scale?

A. You have near infrared, near visible on one end. I'm not sure what's on the other end.

Q. You don't know what the whole electromagnetic scale is?

A. I don't know. I don't have it memorized.

Q. So you're not really saying you're a technical expert about wavelengths and electromagnetic—

A. No, I'm not.

Q. You just know how these machines work?

A. I know how they work. How they're applied, yes, sir.

Q. But you do know that these machines detect energy that's beyond the visible light scale?

A. Yes, they do.

Q. And they have the ability to convert what is normally invisible in the human eye into a visible picture, correct?

A. Yes.

Q. You talked about some objects absorb thermal energy; is that correct?

A. That's correct.

Q. And some emit thermal—everything emits thermal energy, correct?

[87] A. Right.

Q. Some reflect thermal energy?

A. Uh-huh.

Q. Is it possible to tell, for instance, when you were—when Mr. Thomson was pointing the thermal imager at Mr. Hingson here, and they were showing the radius, was it possible for you to tell from that image whether it was reflected from the lights or it was emitted from his body?

A. An observer certainly I think would know the difference between a reflection in that case and a radiation.

Q. How would you know that?

A. Generally reflections are very localized so they tend to move if you move the camera. As the hand-held motion had a little bit of movement, temperature distribution of his jacket and shirt stayed exactly the same. Had that been a reflection off of a surface it would tend to move in relationship with the object that's emitting the radiation.

Q. But you're now positing that the object would have to be in motion in order to tell the difference between reflection and emission. What if it was a stationary object like a house?

[88] A. I'm saying there are instances where you would not be able to tell the difference between reflection and emission.

Q. Okay. That would be one of those situations when the object was stationary without a better test of the actual emissivity of the property that you were testing?

A. If the object was necessary, if the user was stationary, the camera was stationary, it wouldn't be possible.

Q. It would not be?

A. Not be possible.

Q. The basic principle of infrared radiation is that something's actually transmit through objects; is that true?

A. That's true.

Q. So the object is actually emitting its own thermal energy and whatever it's picked up from behind it; is that correct, or absorb from behind it?

A. It could be, yes, depending on the material.

Q. Isn't that Kirkoff's law?

A. It depends, yes.

Q. According to the literature from your company it says, "When the infrared radiated energy [89] strikes an object the total amount of energy is transmitted, reflected or absorbed by the object," correct?

A. (Nods head)

Q. And if you know perhaps what the—what ought to be emitting from an object you can tell if it's emitting too much energy, correct?

A. Yes. I'd say that's correct.

Q. Is that basically the principle that we're operating on in this case, that there's a little bit too much energy being emitted from that object to just be the roof of the hous is that the basic conclusion?

A. I think what we're—the conclusion we're drawing here is that when you look at the structures in the field of view that that structure appears to be different than the other structures in the field of view.

Q. What—if I'm correct now, correct me if I'm wrong, just take a wall, for instance—

A. Uh-huh.

Q. —a wall, if you put a thermal imager on it might give you a particular pattern just like the wall that we pointed the imager at, correct?

A. Uh-huh. Right.

[90] Q. If you have a heat source behind that wall and it got very hot, the wall would absorb some of the heat, wouldn't it?

A. Yes.

Q. Correct? And the heat that's emitting from the heat source is traveling on a direct line; isn't that correct?

A. With the field of view of the camera.

Q. Yes. Thermal energy travels—transmits on a straight line; is that correct?

A. Well, it radiates on the direction from the target.

Q. Is it not true that the thermal energy is radiated—is transmitted in a straight line?

A. My answer was the energy is radiated on the direction from the surface.

Q. The wall would absorb the heat source that was behind it; is that correct?

A. Right.

Q. And then would emit not only its own thermal energy, but it would also emit energy from the heat source behind the wall?

A. That it was absorbing and reemitting.

Q. Okay. Therefore the thermal imager would say this wall is hotter than perhaps the adjoining [91] wall, correct?

A. Correct.

Q. And we could deduce that there's something behind the wall heating that wall up; isn't that right?

A. That would be a conclusion that you could draw, yes.

Q. So really by detecting the thermal emissions from the wall we are able to deduce that there's something else behind the surface that is providing extra energy; is that right?

A. I think that's correct, yes.

Q. So in the anomaly situation that you were describing about the house in this case, the fact that the thermal imager was able to pick up thermal anomalies allows the operator to deduce that there is a heat source under the roof, correct?

A. Yes.

Q. The whole point of thermal imaging, at least in it's industrial use it's non-destructive testing; is that right?

A. That's right.

Q. Meaning you can't tell if there are problems without going intrusively into something and destroying it to find out?

[92] A. That's correct.

Q. Some of the examples that I read about and I saw also in the literature from Flir are that you can detect moisture under the surface of a roof by using thermal imagers?

A. Uh-huh.

Q. Is that yes?

A. That's a yes. I'm sorry.

Q. All right. The court reporter has to pick up your—

A. Yes.

Q. And that allows a person to determine that there's a problem underneath the surface of the roof without actually having to destroy the roof first; isn't that right?

A. In that case, yes.

Q. Okay. It does give subsurface information?

A. It's actually reading the surface but—

Q. Reading the surface but revealing something about the subsurface, correct?

A. Right.

Q. Now, infrared radiation is detectable in, I think, the jargon is the near infrared and the far infrared; is that right?

A. Yes.

[93] Q. That's because if there are some atmospheric problems that interfere at some point along the thermal reading—that was a very clumsy question. I'm going to start over again. There are no thermal imagers that detect the entire infrared spectrum; is that correct?

A. Not to my knowledge.

Q. Each target has a particular range of infrared wavelengths; is that right?

A. Each camera?

Q. Yes.

A. Each camera typically looks at a range of radiation, yes.

Q. The Flir infrared focal imager cameras that you were using focus on the far infrared scale; isn't that correct?

A. No. They're near infrared.

Q. They are near infrared?

A. We call it shortwave.

Q. Shortwave. What is the wavelength that that will detect?

A. 3.6 microns to 5 microns.

Q. And the Agema, that's also a short—

A. Also short wave, yes, sir.

Q. And detects in the near infrared range?

[94] A. Shortwave range, yes.

Q. Do you know what the lowest wavelength is that it can detect?

A. I believe that it's 2.8 microns.

Q. Are you certain or you said you believe?

A. I'm not certain.

Q. It's possible that it could go lower than 2.8?

A. It's possible. I have not personally tested it, no.

Q. What about the Probeye, does that go lower?

A. No.

Q. What is the range of the Probeye?

A. It's three to five.

Q. Three to five. You were talking about how it's not possible to use infrared to see through glass. Is that absolutely true in all cases?

A. I didn't say it wasn't possible to not use infrared through glass.

Q. I thought that that was the point of the demonstration not being able to see through the window?

A. In that particular case we couldn't see through the windows. There is in the short wavelength some limited transmission. That depends [95] to a certain extent on the type of glass and the thickness that's involved in the wavelength of the camera that's viewing it.

Q. It's possible because glass actually is a very good emitter of thermal radiation up to about three microns; isn't that correct?

A. It's a good emitter and it has some transmission as well.

Q. And also it's possible to reduce the detection ability or improve the detection ability down to a shorter wavelength depending on the type of lens that you're using on the thermal imager, isn't that possible?

A. It's possible to use a filter to reduce the amount of energy or to narrow the band width of observation with an infrared imaging system, yes.

Q. So it is more that window transmits and there's also a way that infrared can come down into that visible and transmission zone so that a thermal imager can see through glass under certain circumstances; isn't that correct?

A. There are circumstances where infrared imagers could be made or optimized in theory to see infrared radiation through glass.

Q. You testified that the Agema couldn't do [96] that because it has—I want to get this correct. I ahead think a lead selenide lens?

A. I said its lens was not made of glass. It is I believe to be made of lead selenide.

Q. Actually the lens isn't made of lead selenide at all. It's the detector that's made of lead selenide. Aren't those different, a detector and a lens?

A. They are.

Q. So are you mistaken about that or do you think it's the lens?

A. I know that it could be the detector is lead selenide. I'm not sure what the lens is made up of. said at the time I believed that it's lead selenide.

MR. LERNER: May I approach the witness, Your Honor?

THE COURT: Yes.

BY MR. LERNER:

Q. Mr. Martin, I'm going to show you a document that's paper clipped. Can you please read what the top of it is?

A. Specifications for Ruggedized IR Thermal Viewer.

Q. And this is on Agema Infrared Systems stationery?

[97] A. Yes, it is.

Q. I'm going to direct your attention, if I could, under 3.2.1.7. What does that say?

A. It says detector type, the detector should consist of a solid state thermal electrically cooled 48 element lead selenide array which provides 48 line parallel scans over the eight degree by 16 degree field of view. The number of scan lines must not change with varying scene temperature.

Q. Okay. So what it's saying under detector type is that the detector type is a selenide, lead selenide vertical array?

A. Uh-huh. Just so I can be clear. Lead selenide is used extensively as a lens material and as a window because it's transparent with infrared.

Q. Okay.

A. That doesn't exclude it from being a detector or from it being a lens.

Q. All right. Well, I don't want to get confused. I just want to see what this machine uses. Under a different part of this information it talks about the IR window. That's the lens, correct?

A. It is. The IR window shall be anti-reflection coated silicon.

[98] Q. Okay. So the 210 actually has a silicon lens with a lead selenide detector, correct?

A. Correct. Lens may actually be an overstatement in the 210 in that it mechanically focuses as opposed to having an optic that focuses like a camera.

Q. What is the transmission capability that silicon has for transmitting visible light?

A. I don't know.

Q. Isn't the reason—isn't there a reason why silicon lenses aren't used on your higher end machines, they use germanium, Sapphire and things like that?

A. I think it's an engineering choice made based on the particular product.

Q. Do you know the reason why?

A. I don't believe that there is—some lens in high end systems are infact selenide some are Sapphire some are germanium.

Q. So if I understand it we boil this all down it is possible for a short wave thermal imager to see through glass?

A. It is possible.

Q. Is it possible that the Agema 210 can see through glass?

[99] A. It is possible, yes.

Q. And that would be true even if the room was dark; isn't that right?

A. That's correct.

Q. It would be picking up thermal—it doesn't depend on light?

A. It does not depend on visible light, no.

Q. So in that circumstance even though an individual's standing outside of a home could not see into the room the thermal imager could see in through the glass, correct?

A. In theory that's correct, yes.

Q. Okay. Does—you're showing us how clothing itself doesn't really appear too much with infrared radiation. Is it

possible that images to be picked up through thin curtains and things of that nature?

A. It does interfere significantly. So, no, I don't believe it could be picked up through thin curtains. We were looking there we were basically we have strong physical contact between the radiator which is the body and the clothing. If you held the coat out in front of you 15 inches you wouldn't see through it.

Q. Well, I have heard of a Flir device being [100] used at the airport to discover money belts held around people's waist?

MR. THOMSON: Your Honor, I would object—

THE WITNESS: I have no knowledge—

MR. THOMSON: —Mr. Lerner has heard.

MR. LERNER: This is an article from The Oregonian.

THE COURT: I will sustain the objection to the form of the question.

BY MR. LERNER:

Q. Have you heard that the Flir thermal imager can detect a money belt that is worn around the waste?

A. No, I have never heard that.

Q. Now, to get back here to this point. If a window was open, let's say on a summer evening, and it was dark in the room, there certainly would be no problem with any thermal imager detecting activity through the opening; is that correct?

A. That's correct.

Q. And that would be true also if there were curtains?

A. I don't think so. I mean curtain material varies dramatically. But if you're talking about generally curtains, no, you would not be able to see people behind the curtains unless they were directly [101] against them.

Q. Or maybe if they were close to the window?

A. They'd have to be very close.

Q. If people were in their bedroom and the window was open on a summer evening, it was dark, would it be possible to tell if people were embracing?

A. It would be possible.

Q. Can the thermal imager be used on the human body?

A. To look at the human body?

Q. Yes.

A. Certainly.

Q. According to the literature from Flir, the skin, human skin is almost a perfect emitter?

A. Very, very good emitter.

Q. So it's possible to use the thermal imager on the human body and detect subsurface problems in the human body?

A. It is used in some physiology applications.

Q. Such as circulatory problems?

A. Yes.

Q. Could you tell if a person had become sexually aroused?

A. I have no idea.

[102] Q. Could you tell if a woman was having her menstrual period?

A. I don't believe so, no.

Q. Do you know?

A. I don't know.

Q. Does the Agema 210 have an internal calibration system?

A. I don't believe so, no.

Q. Does it have a position that it automatically comes on to when you turn the machine on?

A. It returns to the position that it was in when it was turned off.

Q. So the last person to use the machine and then turns it off is basically setting the machine for the next user?

A. They are setting the levels of sensitivity.

Q. It doesn't revert to any preset position?

A. Not to my knowledge.

Q. Is the—so as I understand it then, two different 210s could be turned on and they would show different images because they could have been used at different times and result in different adjustments?

A. It's possible to take two 210s and have the images be set up differently.

[103] Q. And I think you said earlier there's no internal reference point for the operator to know exactly how hot anything is?

A. There is not any internal temperature reference point that's displayed on the screen.

Q. Nothing that's on the screen or even coded into the videotape?

A. Nothing that's coded into the video. It's a qualatative system as you described.

Q. There's no reference card that's given to the operator so they can tell that this is middle grade or that equals 50 degrees?

A. No.

Q. So all of the adjustments then are being made by the operator?

A. Right.

Q. They have to not only adjust the focus but the brightness and the contrast?

A. Correct.

Q. And by doing that they can actually make the white whiter, can't they?

A. They can certainly add contrast, yes.

Q. By adding contrast, that means the whites will be brighter, correct?

A. Right.

[104] Q. And the dark will be darker?

A. Yes.

Q. This is done with those buttons that you showed the judge how to use?

A. Right. Brightness and contrast.

Q. And there's no markings or dials on that machine that shows that anybody—where they had actually set it?

A. No.

Q. So when you testified that the results of the 210 are repeatable, it's not really possible for someone to go back a month later and repeat the same process and know the exact settings that a person has, is it?

A. It's not possible to know the exact settings. It is possible when it is done by the hundreds or thousands of users of that type of equipment to go back and to look at objects over again and determine if you've got thermal anomaly.

Q. So you can use the machine as many times as you want to but you don't know how to actually replicate a prior videotape?

A. You can't replicate it exactly, no.

Q. It's possible, is it not, then to overexpose or overexpose an image?

A. It is possible to overexpose an image, yes.

Q. Since the—is there anything internal to the machine that tells the operator that they are over adjusting or exaggerating the whiteness?

A. No. It's up to the operator.

Q. All right. And then the conclusions that the operator might make are based upon looking at different buildings in the surrounding areas, would you say?

A. Yes.

Q. But I thought you were saying that you would want to compare apples and apples?

A. To the greatest extent possible, yes.

Q. Well, to do a real scientific experiment there would not have to bethere would have to be more than just the greatest extent possible, it would have to be apples to apples to make a valid comparison; isn't that correct?

MR. THOMSON: Objection, Your Honor. This is argumentative.

MR. LERNER: I don't think it's argumentative.

THE COURT: Overruled.

THE WITNESS: Can you ask the question again?

[106] BY MR. LERNER:

Q. To do a valid scientific comparison you would want to compare apples and apples, correct?

A. Yes.

Q. If there were any variations in the types of apples that you're using or apples and oranges, you cannot make a really valid comparison from a scientific standpoint; isn't that true?

A. I think from a practical standpoint you can absolutely make those comparisons.

Q. I'm not asking about practical. I'm talking about the scientific use of thermal imaging, talking about people's homes here. Is it not correct, as you said, that you want to compare apples to apples?

A. It is correct.

Q. Is there any way to know without actually going into these homes which one has better insulation than the other?

A. No.

Q. And that would make a big difference on whether one roof was emitting heat and one roof wasn't?

A. It could, yes.

Q. Or if one was not occupied and the other [107] was occupied, that would make a difference in how they appeared in comparison to one another?

A. It could, yes.

Q. And there's also all kinds of atmospheric reasons why two buildings might look somewhat similar from the outside but actually have very different thermal atmosphere; isn't that right?

A. No, I don't believe so.

Q. Well, does the presence of bushes, shrubbery and overhanging trees have anything to do with thermal imaging?

A. Certainly if the target is blocked from the view, that would have an impact on thermal imaging.

Q. Well, the circulation of air would have an affect, wouldn't it?

A. Atmosphere continuation is relatively small.

Q. Is that the answer to my question?

A. Yes.

Q. Does the circulation of air have anything to do with how hot a wall would look, or cool?

A. It might, yes.

Q. So if a wall was exposed sort of as that picture right there, that outside wall that we're looking at, this wall (pointing) is completely [108] exposed to the open air?

A. Uh-huh.

Q. Correct?

A. Correct.

Q. And this could be cooled by the night air quite easily, correct?

A. Correct.

Q. Where the interior wall here between the houses is not quite as exposed to the ambient temperature and the cool night air?

A. I would say it's equally exposed. There's just less exposure. Less area.

Q. Less area of exposure?

A. Well, the side of the house is much—in square feet is much broader compared to the—smaller area.

Q. I'm not following what you're saying.

A. Well, the question is atmospherically I think the effect is the same. The difference is you have the end of the house which is a very large area and you have a much smaller area on the center portion there.

Q. You mean being exposed to the air?

A. My point is I don't think it's atmospherically any cooler in the middle area next to [109] the side wall than it is at the end next to the side wall.

Q. Wouldn't it be cooler at the end than in the middle?

A. Not necessarily, no.

Q. What do you mean "not necessarily?" Could it be cooler on the end than in the middle?

A. It could be cooler but there's no reason to assume that.

Q. Okay. Thank you.

MR. LERNER: I have no other questions.

MR. THOMSON: I have just a couple.

REDIRECT EXAMINATION

BY MR. THOMSON:

Q. In the video tape that you saw that was done in this case, Government's Exhibit No. 1, did the operator run the imager, the camera through all of the different settings while he was taking his pictures?

A. He appeared to go through the full range of settings on the camera.

Q. And is that the best way that you know of to recreate that situation?

[110] A. Yes, I believe in a qualitative system that's essential.

Q. Can you explain to the Court how you would do that or—and why you would do that when you're taking that kind of a thermal image?

A. Well, in general infrared imaging practice you want to have as many views of the target as you can and you want to vary the contrast and brightness just to avoid the situation that you might be confused by a reflection or something along that line. So ideally you'd adjust the camera from very low sensitivity to high sensitivity or low brightness in contrast to very high brightness in contrast so that you can help to identify the very best possible picture.

Q. And that is what appears to have been done when this imager was made.

MR. LERNER: Objection, leading.

THE WITNESS: I believe it was done.
THE COURT: Overruled. I will let that answer stand.
MR. THOMSON: Thank you, Your Honor.

BY MR. THOMSON:

Q. Also you mentioned earlier and you showed the Court the switch on the 210 for polarity. What does that refer to?
[111] A. Normally, as I mentioned earlier, that white is hot and black is cool and the shades of gray in between represent various temperature values. When you press the polarity invert, that makes black hot and white cool and just shifts the pallet, if you will, or the gray scale upside down.

Q. And was that also done at some point during the making of this video?

A. Yes, it was.

Q. Did you see anything on that video tape that would indicate to you that the 210 that was making the video was not operating properly?

A. No. It appeared to be operating properly.

Q. And if there was some problem with the machine itself, would you expect that you would be able to see that?

A. I would expect so.

Q. And there's no evidence of that?

A. None whatsoever.

Q. Last area I want to discuss with you. If we had one of these machines that had a greater resolution here, either the thousand or assuming Mr. Hingson's correct, the 2,080 by 2,080, would we be able to see through a wall or see through the doors as a person left the courthouse?
[112] A. No.

Q. So what we'd get is a better picture of the wall or a better picture of the window, but we would not be able to see on the other side?

A. I don't believe so, no.

MR. THOMSON: That's all the questions I have, Your Honor.

* * * *

[117] [*DIRECT EXAMINATION – DET. NAFZIGER*]

Q. And if you can generally describe what it was that you said when you said that what you were doing about this, I mean did you tell him a little bit about the investigation?

A. Yes, I did.

Q. Do you recall anything about what you told him about the investigation other than Mr. Kyllo's name came up?

A. No, sir, I don't believe I did.

Q. All right. And what was you're request to Detective Dorman?

A. To check the files down in the Florence office to see if they had any records of Mr. Kyllo or an address in—a different address in Florence for Mr. Kyllo.

Q. And what was the address that Detective Dorman gave you for Mr. Kyllo?

A. 890 Rhododendron Drive.

Q. That's the residence or actually one of the two residence at that triplex that was searched pursuant to the search warrant that was obtained?

A. Yes, sir.

[118] Q. And did you ask him to do anything in particular with regard to the investigation?

A. No, sir. Just—I believe I asked him to drive by the residence to see what vehicles were there.

Q. And did he come up with a vehicle that was registered to Mr. Kyllo and anyone else?

A. Yes. He said that—I gave him two license numbers that were associated with that residence and he told me that those two plates were parked in the driveways of those residences.

Q. Was he able to tell you who either of those two vehicles were registered to?

A. They were registered to Tova Shook.

Q. Did he find any vehicles to your knowledge that were registered to Mr. Kyllo?

A. Yes, he did. A 1972 Datsun.

Q. And was that vehicle registered to Mr. Kyllo alone or with anyone else?

A. Luanne Kyllo.

Q. And the address that the vehicle was registered was what?

A. 878 Rhododendron Drive, Florence.

Q. So the same residence that was ultimately searched?

* * * *

[128] [SGT. DAN HAAS]

DIRECT EXAMINATION

BY MR. THOMSON:

Q. What's your occupation?

A. I'm employed full time by the Oregon Army National Guard under the counter drug program.

Q. How long have you been in the counter drug program?

A. Just over five years now.

Q. What's your rank in the Oregon National Guard?

A. I'm an E-6 Staff Sergeant.

Q. And so you've been in the counter drug program you said for approximately five years?

A. Yes. Just over five years.

Q. At some point in your duties—at some point in your duties in the counter drug program did you become involved with thermal imaging?

A. Yes, I did.

Q. Approximately when was that?

A. Late in 1991. I believe.

Q. I'm sorry?

A. I believe. It's been a while since I've looked at the records.

* * * *

[131] Q. Now, did you actually take a videotape of a thermal imaging readings that you took on January 16th, 1992 with relationship to this case?

A. I don't recall the exact date. Like I say, it's been a while since I looked at the paper.

Q. We have—

A. For this case?

Q. Yes.

A. I did do a videotape of the thermal survey that was done.

Q. We have an exhibit here that's been marked for identification as Exhibit No. 2.

A. Yes.

Q. Does this appear to be your handwritten report regarding the thermal imaging that you did, copy of it?

A. Yes, it is.

Q. And this indicates that it was done on January 16th, 1992 at approximately 3:20 a.m.; is that correct?

A. I agree with that.

* * * *

[135] Q. And where did you have to go in order to use the camera?

A. The thermal system was operated from the passenger's seat of Special Agent Elliott's vehicle. Across the street at the intersection was where I first started recording, looking at the building. Then we drove forward across the street and took a look at the buildings from the back also.

Q. Did you ever have to leave your vehicle in order to use the imager?

A. No.

Q. And you say you took a look at the back of the structures. Would that be the view that's represented by 4A, the photograph that I have?

A. Yes.

Q. All right. And Exhibit No. 5, is this the structure that you were primarily looking at, the one that was in the middle?

A. Yes.

MR. THOMSON: Appears that we may be having me technical difficulties here again, Your Honor. We're just going to try to use one of the other—I'm sorry, Your Honor, by switching the cameras we've got to fix this up. I'm sorry [136] we didn't have it set up sooner. It's not plugged in the back. It got moved around. Try it now. There we go. I'm going to turn this now so the Court can see this, Your Honor. We do have it working now. Thank you for being patient.

THE COURT: All right.

MR. THOMSON: I'm going to play the tape for you to watch.

THE COURT: I can see that well. I think that people should move down this way.

BY MR. THOMSON:

Q. If you would. If you see something that's significant if you could—so you can tell us so I can point that out to the Court, please.

(Tape playing)

A. The way the—this thermal imaging camera is set up the warmer object is the brighter it's going to be. The center building is obviously radiating a lot more heat than the buildings on either side of -- from the roof, the garage door.

Q. Is this the center building that I'm pointing at now?

A. Yes, it is. You also notice some of the [137] shrub marks, not there, a little bit up higher. On the way—come to your right a little bit. Right in there. And one more farther to the right.

Q. (Complying)

A. There.

Q. What's significant about those?

A. There are no vents on the roof corresponding to those warm patches. That other one very bright spot did appear to be a vent. You can see the vent on that residence right next to it is not nearly as warm.

Q. This here you're talking about or?

A. Yes. Also the garage door. The one on the center building is much warmer than the one to the left.

This is from the back.

Q. This would be corresponding to the Exhibit No. 4?

A. Yes. The vent on the end of the house of the center house is radiating excessive heat. And that entire wall. However, because of the location of that wall between the two buildings I didn't worry a lot about that. Could be heat trapped in between the two buildings. Right there—there is a button on the [138] Agema 210 which will—it's called the polarity button, for the operator to change over so that either black or white appears hotter. At that time I hit the button making—so that the black would appear hotter. There is using the same tree as a background to compare the heat coming from that vent to the heat from the transformer so that the two objects would have the same background. You can still see the roof of the second center building is much—is warmer than the buildings on either side. And, again, you can see the splotchy marks on the roof toward the peak.

Q. That's the extent of the videotape?

A. Yes, it is.

Q. Now, did you attempt to depict what we've just seen on the videotape on your diagram that went with your report that's Government Exhibit No. 2?

A. Yes, I did.

Q. Could you, holding this up for the Court, show the Judge and just point and describe if you will how you attempted to depict that for us, please?

A. From the front view attempt to show the hot spots on the roof which I considered to be the major—major location of an unusual heat source, [139] and a garage. Through my

own experience and training that I have done I have found that quite often there can be a dryer running in a garage which would explain why the garage door itself would be warmer. However, to have heat over the entire roof and specifically over a garage and then in addition to two other hot spots on the roof, in the training we've done with the high pressure sodium halide lights and the metal halide lights, found that a lot of the—in an uninsulated roof you'll get that same type of splotchy marks. On the back view I tried to depict that that vent was extremely hot, much more heat between these two buildings than this and also the same sort of splotch markings at the peak of the roof.

Q. And what conclusion, if any, did you reach after having used the Agema 210 to perform this examination of the outside of the roof?

A. The main conclusion that I reached was that there was definitely something unusual within the structure that was generating that excess heat. The splotch marks were similar to other—to heat patterns that I had seen in other indoor marijuana grows. But since I didn't see any plants myself I wasn't prepared to say that it was in fact a [140] marijuana grow. But I did tell Agent Elliott that it was unusual and that it was consistent with what I had seen at other grow locations.

Q. Now, have you in any of your experience using a thermal imaging device found that you were able to see through walls and see either people or activities inside of a building?

A. No.

MR. THOMSON: I don't believe I have any other questions for this witness, Your Honor.

THE COURT: You may inquire.

MR. LERNER: Thank you, Your Honor.

CROSS-EXAMINATION

BY MR. LERNER:

Q. How are you?

A. Fine. Thank you for asking.

Q. We've been on a number of cases, haven't we?

A. Yes, we have.

Q. You were very cooperative and brought over several of the materials from the subpoena that we had issued for your training?

A. Yes.

* * * *

[142] Q. Would it be fair to say that you had not had extensive training by the time that you did this particular thermal image?

A. Yes.

Q. That's fair?

A. Yes.

Q. The other cases that you said you had worked on up to this point, were they also with Agent Elliott?

A. I believe this was the first time I worked directly with Special Agent Elliott.

Q. How many other cases had you worked on prior to this?

A. I don't recall an exact number. Are you referring to just thermal imaging cases?

Q. Yes, thermal imaging.

A. I don't recall.

* * * *

[155] Q. And in that criticism you said that there really was not enough time to completely and comprehensively cover the area of thermal; imaging training; is that right?

A. Yes.

Q. There were questions about legal issues that were not answered at that training?

A. Yes.

Q. That there was conflicting information given out?

A. Yes.

Q. Correct? And that it was continually stated at the course that this would certify people as thermographers but that you did not feel that it was valid for that purpose?

A. (Pause.) I'm trying.

Q. Throughout—

A. I'm trying to recall whether it was continuously stated we would be certified or was stated prior to that that we would be and then throughout the course we stated that we would not be.

Q. Oh.

A. I—

[156] Q. And what you received from that course was a certificate that you had attended the course?

A. Yes.

Q. You also, in your training, I think in 1992, after having been at this course—this DEA course, you participated in some training of Oregon National Guardsmen and Michigan National Guardsmen in the use of thermal imaging?

A. Yes.

Q. I'm going to show you Defendant's Exhibit 104B. Is this the after-action report that you wrote concerning that training?

A. Yes, it is.

Q. Now, when you had written that report at the end you noted in the last paragraph that a common mistake was made by people who had been trained in thermal imaging at this course that you were offering. Isn't that correct?

A. This was a one-day class.

Q. A one-day class.

A. Yes.

Q. It's a common mistake to identify the specific building as containing the marijuana grow; isn't that right?

A. Yes.

[157] Q. That the individuals would jump to the conclusions and they had to be told you can't jump to conclusions?

A. Correct.

MR. LERNER: I'd offer that as well, Your Honor.

MR. THOMSON: We have no objection to that, Your Honor.

THE COURT: Received.

(Defendant's Exhibit 104B received.)

BY MR. LERNER:

Q. And what you're saying today is that there really is no way to affirmatively say that there was marijuana growing inside a particular building without going inside?

A. Not based exclusively on this, no.

Q. But it does indicate quite a bit of information that there's heat inside the building being generated to the outside of the building, correct?

A. The amount of heat coming off the outside indicates that, yes, there is something warm inside.

Q. Something—

A. Or that the surface itself is extremely warm.

* * * *

[160] Q. And in your own—in your own report that you have up there, you yourself said that this was consistent with—or let me get the words that you used here. You told Mr. Elliott that this was consistent with the marijuana grow?

A. I'd have to take a look at that to give you the exact words. I can't see it from here, and I can't recall that from that long ago.

MR. THOMSON: Your Honor, may I make the exhibit that he's referring to available?

THE COURT: Yes.

MR. THOMSON: (Handing)

THE WITNESS: (Pause—referring)

All this says is that I observed high heat loss from the roof of the one structure above the walls—or above the garage and from the wall facing the other structure.

BY MR. LERNER:

Q. Wasn't there another page to your report?

I believe—I honestly don't recall if that was another written page or if that was part of a telephone conversation I had with Special Agent Elliott.

Q. Special Agent Elliott wrote in his [161] affidavit that quotes—I'm on page 6 of the affidavit, Sergeant Haas, states that based on his training and experience "heat loss was unusually high compared to comparable residences in the proximity of 878 Rhododendron and the heat signature was indicative of indoor marijuana grow operations that he has viewed in the past." Was that a true statement? Did you tell him that?

A. I honestly couldn't tell you the exact words I used, but if that's what he wrote down, that—then I would be inclined to say that yes, I did.

Q. Can you tell us approximately how many missions you performed for the national—as a National Guardsmen for law enforcement doing marijuana interdiction in a year?

A. Using thermal imaging for—

Q. Uh-huh.

A. First couple of years I believe there were some—some months that averaged 3 or 4. Others where it could be one for every two months. Overall average, I believe it's just over 10 a year.

* * * *

[164] BY MR. LERNER:

Q. You were talking about seeing the heat impression from using the thermal imager at Mr. Kyllo's house. I'd like to talk with you about that. Do you remember specifically going there during the daylight hours and taking a look at it?

A. No, I don't recall specifically going.

Q. You don't remember whether you did or you didn't?

A. No. I would say that we did because—I always have but—

Q. You have no specific memory?

A. Correct.

The theory of infrared transmission that you were relying on is that whatever is underneath [165] that roof in that attic is heating up the roof in some way to cause those splotchy areas that you were noticing radiating off the roof; is that correct?

A. You said infrared transmission and that is not something that I am even considering in this case.

Q. Okay. There is something that when you looked at the infrared image you saw hot or white areas on the roof, correct?

A. Yes.

Q. And that told you that those portions of the roof were somewhat warmer than some other roof that you might be comparing to?

A. Yes.

Q. That also told you that something was heating up that roof surface?

A. Yes.

Q. Correct? And that surface was being heated by something that was up underneath the roof?

A. That was.

Q. Correct? That there was some light or heat or some type of source underneath the roof?

A. At that time of the morning, yes.

Q. And that heat was being absorbed by the roof material, correct?

[166] A. Yes.

Q. And then being emitted out into the atmosphere where you could detect the surface temperature of the roof itself?

A. No, I could not detect the surface temperature.

Q. You could detect that there was thermal energy being emitted to a high degree from the roof?

A. I could detect that there was a difference in thermal temperature. Or thermal energy being radiated from the surface of the roof.

Q. Which led you to believe that there was something like a marijuana grow or something going on inside the house?

A. That there was something unusual—unusual under that roof, yes.

Q. Have you ever used thermal imaging devices that do actual temperature measurements?

A. No, I have not.

Q. There is no way for you to tell exactly how hot that roof was then?

A. No, there is not.

* * * *

[168] Q. Are there things around the building that could cause certain—the thermal imager to pick up heat differentials that have to do with the environment?

A. Yes.

Q. Do you know what the term "micro climates" means?

A. I believe I could infer a meaning of it but I couldn't give you a textbook definition, no.

Q. That's not part of your training?

A. (Shakes head)

Q. Can moisture in the atmosphere affect the reading of the thermal energy?

A. Yes.

Q. Do you know whether or not it had rained that day in Florence?

A. I don't recall if it had or not.

Q. Are you aware that thermal imaging devices can be used to determine that there is roof moisture underneath the roof surface?

A. Yes.

Q. Because some roofs leak and they collect moisture and it affects the insulation?

A. Yes.

[169] Q. How did you distinguish—what kind of training do you have in distinguishing roof moisture problems from marijuana grow problems?

A. Specific training, all I could focus on would be another portion of the electro optics of the thermal sense conference in Florida. One portion of one of the classes dealt with closed—enclosed buildings, doing building inspections during construction. There was a portion of a class that was a study, and I believe it was Finland, on that. And also looking around at my parent's house, my own residence, several buildings in the neighborhood just to get use to—and get an idea of what was normal for different types of structures and what was not normal.

Q. You don't know whether there was roof moisture or not, did you?

A. Specifically, no.

Q. And you don't have any training in differentiating roof moisture from a light sources? Is there any way that the thermal imager tells you it's one way or the other?

A. (Pause) That's—that's—

Q. You were—there was no way for you to [170] know whether or not the roof of the surrounding houses had the exact same emissivity as the house that you were targeting, did you?

A. By looking at the roof of the buildings adjacent to that location, I could tell that they were made of the same type of material. As for an exact emissivity rating, that's not something I even concern myself with because the system is not calibrated on that. I'm not going for an exact temperature difference. Just a difference in temperature.

Q. Right. But different things will emit at different rates, different materials emit at different rates so that would make a difference in terms of how the imager would read, wouldn't it?

A. Part of the reason the thermal survey was done in the early morning hours is to decrease the chance of heat from

the sunlight or so -- and that has more to do with emissivity than a heat source inside radiating to the outside.

* * * *

[175] Q. And subsurface moisture can also affect infrared readings of the surface of the targets, isn't that true?

A. Yes.

Q. Infrared radiation will emit more quicker through water than it will through the ambient air; isn't that right?

A. I couldn't say for sure about check without checking.

Q. Do you know whether if a roof is wet whether it will show it warmer or cooler than a roof that is not wet?

A. I couldn't say if it would be warmer or cooler, only that it would be different.

Q. Okay. So you don't know?

A. Correct.

Q. Aren't there other situation national and atmospheric conditions that can affect an infrared reading?

A. Yes.

Q. Overhanging trees and bushes, things like this?

A. Yes.

Q. When there's cloud cover or not?

A. Yes.

[176] Q. When there's a natural circulation of air or not?

A. Yes.

Q. When there is insulation in the building for instance or not?

A. Yes.

Q. Walls that are insulated will emit less radiation from the inside of the structure than a wall that is uninsulated; isn't that correct?

A. Pause.

Q. You look puzzled. Don't you think people put insulations in their homes to keep the heating in?

A. Yes.

Q. So it's makes sense that an insulated wall contains the heat more?

A. Yes.

Q. And the insulated wall emits more radiation?

A. Yes.

Q. So when you're looking at Kyllo's garage it makes sense that the garage is not going to be as insulated as the rest of the house?

A. Yes.

* * * *

[180] Q. So there's no default setting that is normal, it just goes back to wherever the last person left it?

A. Yes.

Q. Do you know in the scene that you were looking at what temperature would be the very median or middle grade of the scene, what temperature that would have been?

A. No.

Q. It can't measure temperatures?

A. No.

Q. It can't tell you how hot the target is?

A. No.

Q. The AGEMA has controls that allow you to increase the brightness and increase the contrast or decrease the brightness or decrease the contrast; is that correct?

A. Yes.

Q. And those are really up to you to manipulate, correct?

A. Yes.

* * * *

[182] Q. I'm saying that no one can verify the agency of what you did by going back and doing it the same way?

A. They could -- another thermal scan would be done the same way.

Q. But not at the same settings because nobody knows what settings that you used?

A. During the thermal scan now I adjust both brightness and contrast up and down to get different idea of comparison. A person who is doing another scan if they ran through brightness and contrast also, they're bound to hit the exact same settings at some point.

Q. Uh-huh. So anybody operating the camera can go as wide as they want or as vague as they want on the contrast and brightness scale?

A. Yes.

Q. And these are completely up to the individual?

A. Yes.

Q. Because there's no suggested settings that the manufacturer gives you?

A. There are no specific settings for general use that I'm aware of.

[183] Q. And no reference to normal temperature, how to calibrate it to the ambient temperature?

A. No.

Q. So everybody's just using their own subjective judgment about where the appropriate setting is?

A. Yes.

Q. And as you recognize, some people jump to conclusions that marijuana is in a building because they know that they're looking for marijuana?

A. Yes.

Q. And so it's possible for someone to subjectively crank up the brightness to verify their preconception that that's what they're looking for and find it there?

A. Yes, I suppose.

Q. Okay. Certainly the operator who—like you yourself know the purpose of the mission?

A. Yes.

Q. Why does the Agema 210 have such a box he image on the video that you took?

A. Because it utilizes 48 detectors that are stacked vertically and it scans back and forth. It only has basically only has 48 images in different, you know, set side-by-side.

[184] Q. You mean it gives you a limited number it doesn't give you like a photographic picture?

A. Yes.

Q. It requires some interpretation by the operator?

A. Yes.

Q. Why does the 210 darken the background around the white areas?

A. Darker the background around the white areas.

Q. You haven't ever noticed that it tends to darken the areas around the white areas?

A. Because it's doing a qualitative comparison. It is not measuring specifically, it is—if an object that is warmer than the object next to it is going to appear to be brighter.

Q. You're saying that—

A. There's—

Q. —when there's a distinctly white image and there's a darker and *halo around it that that machine is supposed to be doing that?

A. If—

Q. Or have you ever heard that?

A. I have noticed that. And that's one reason I try to work through the brightness and contrast so [185] that I can get a recognizable image, something that not only I can tell what I'm looking at but somebody else viewing it would be able to tell what they're looking at.

Q. Why does it give you that black halo around white—

A. Normally when the contrast is extremely high any temperature difference or more of attempt difference is going to appear much more dramatic.

Q. Do other cameras do the same thing?

A. Yes.

Q. All the cameras that you're familiar with?

A. Yes.

Q. Which ones?

A. The ISI Video Therm. The AN/PAS -18 which is the military version of the Agema 210.

Q. AN/PAS-18?

A. Yes. That's also known as—

Q. Which model number of the video?

A. The '91 and I believe '95 are the two that I have been exposed to. As well as the AN/TAS-4A.

Q. AN/TAS. T-A-S.

A. Yes. Inframetrics IRTV 445.

Q. They all do that?

[186] A. If you—if you don't have the controls set for a viewable picture, yes.

Q. So what you're saying is that they will give you that halo effect if you're not setting it properly? But the Agema does it at all levels?

A. I wouldn't say it's doing it if you're not setting it properly. Depends on what you're using it for. For military application, if you're trying to identify enemy vehicle, that could be a very beneficial because it highlights that vehicle even more than the surrounding making it easier to pick out.

Q. If you're looking for a vehicle target?

A. Yes.

Q. In a war situation?

A. Or if you're using the equipment for surveillance of an area looking for a vehicle or person or just movement.

Q. So it's useful in the military applications for the machines to exaggerate the white areas and make them more distinct?

A. Yeah.

Q. Does the quality of the picture on the Agema 210 have anything to do with its recording capabilities and playing back capabilities?

A. The—are you referring to the blackness [187] of it?

Q. Yes. Well—

A. Yes.

Q. I'm referring—

A. It records the same thing that appears through the view finder, yes.

Q. Well, that's what I'm trying to find out. Is the view finder giving you a better picture than the video that you're playing back or not?

A. Because the video degradation, I would think so.

Q. You don't know?

A. No.

Q. Now, the purpose of using the infrared in marijuana he RAD case is to see if you can determine 16 unusual heat coming off of a home; isn't that correct?

A. Not necessarily a home. Any building.

Q. Well, let's focus on the home since that's the case in this case, all right?

A. Yes.

Q. The purpose of the thermal scan was to detect areas where there would be unusual heat--

A. Yes.

Q. —coming from the—off of the house, [188] correct?

A. Yes.

Q. Which tells you that there is a heat source inside the house generating some heat onto—into the roof and then emitting that you can read?

A. Yes.

Q. Isn't it useful it can actually that kind of information can confirm other information that an officer might have?

A. Yes.

Q. And also it can give you a fair idea of the location of the heat source within the home?

A. The general area, yes.

Q. Like the attic—

A. Yes.

Q. —for instance, or a bathroom?

A. Yes.

Q. Or a garage?

A. Yes.

Q. So it tells you information about where in the house a heat source might be located?

A. Yes.

Q. And it can also tell you if there's anomalies in the wall like insulation missing; isn't this correct?

[189] A. It can, yes.

Q. It can tell you someone may have a concealed wall safe in a wall, couldn't it?

A. Yes.

Q. Or if they stashed money or drugs in a wall?

A. Yes.

MR. LERNER: I don't have any other questions.

* * * *

[205] *REDIRECT EXAMINATION*

BY MR. THOMSON:

Q. Sergeant Haas, one of the things that you testified to on cross-examination is that the Agema 210 could be manipulated to such an extent that an operator could make it look like there was marijuana growing someplace if that's what he thought. Did you realize you said that?

A. No, I did not.

Q. Is that true?

A. No. You wouldn't be able to identify anything as marijuana or make it look like that.

Q. Now, please explain to the Court, and if you need to use the 210 we had brought, I guess I didn't bring that one back with me. That's all right. I want you to explain to the Court how you manipulated the controls on the 210?

A. On the Agema 210 there is a focus ring on the side when you're holding it that you can adjust with your thumb to literally adjust the focus of the image. There are also plus and minus buttons for1 brightness and contrast. And just by pressing that button much like—guess I was going to say on a camcorder but that's just for the wide tell photo. But it works

[206] a lot like that. Just plus and minus and the picture gets brighter and down. Try to work through the entire range of that to--

Q. Is that part of your training that when you use the equipment that you try to go through the entire range of brightness, the entire range of contrast and then simply to focus the machine?

A. Try to focus it first. Get an image that I can at least identify basically get it in focus and then I try to use a—I call it a soft focus where it—the image just looks like a black and white picture. Almost a negative image of the object. Then adjusting the brightness and contrast until the object is no longer visible, either it has been completely blacked out or just washed out and light.

Q. And wouldn't someone else taking the same kind of a thermal scan be able to do exactly the same thing to run the controls to both ends?

A. If they tried to they—yes. If that's what they—

Q. That's what you're trained to do when you're doing one of these.

MR. LERNER: Objection, Your Honor. He's leading the witnesses. Now he's already asked and answered this question.

[207] THE COURT: Did you get to finish that question.

MR. THOMSON: I think I did, Your Honor. What I asked is if that is what he was trained to do was to take the controls to both ends of the spectrum.

THE COURT: All right. Well, I will overrule the objection. You may answer.

THE WITNESS: Yes, it is.

BY MR. THOMSON:

Q. And is that what everyone is trained to do.

MR. LERNER: Objection, Your Honor. He's already said he does not know how many people are trained and what everybody's training is. He's not qualified to answer that.

MR. THOMSON: Let's me rephrase the question.

THE COURT: All right.

BY MR. THOMSON:

Q. In the courses that you have attended is that what they have trained you and the other persons in in those course to do?

A. In the information I was given by Sergeant Hauge he, in the class that was taught by the DEA and in the classes that the National Guard is now putting [208] on that is what is taught.

Q. And what type of a certificate did you receive from the DEA?

A. It was a certificate that I had attended the course.

Q. And do you know if there are any standards that are set up by DEA for the courses that they give in order to give this certificate?

A. I don't know what all of their standards are. I—from conversations I had there it was expressed very clearly to me—

MR. LERNER: Objection, Your Honor. Hearsay.

THE COURT: Well, overruled.

THE WITNESS: Okay. That the—I would have to demonstrate a fairly solid grasp of the principals that were instructed they're to receive that certificate.

BY MR. THOMSON:

Q. All right. Now, I realize that when you did the thermal scan in this case that you had not been involved very long in the thermal imaging; is that correct?

A. Yes.

Q. With all the information that you have learned since that time, and we're talking more than [209] three years since then, is there anything that you would have done differently on this occasion on January 16th of 1992?

A. The only thing I probably would have done would be try to go back again later but for that specific video, no.

Q. And looking at the video and recalling what occurred, does it appear to have given you the kind of image that you would rely upon today?

A. Yes.

Q. Is there anything that you can think of in the setting that was in this case that would have made it possible for you to manipulate those controls to make that center building look hotter than the other two—is there some way you could have done that?

A. Without it actually being hotter?

Q. Yes.

A. No.

MR. THOMSON: I don't believe I have any other questions.

MR. LERNER: A short follow-up, Your Honor.

THE COURT: All right.

[210] *RECROSS-EXAMINATION*

BY MR. LERNER:

Q. Let me get this straight now. You did say that many people in your training exercises incorrectly jump to the conclusion that they're seeing a marijuana grow?

A. Yes.

Q. And really what they should be saying is they just see a heat anomally, correct?

A. Yes.

Q. Okay. It is possible, as you said, to manipulate the brightness and contrast to identify, in your words, a heat anomaly?

A. Right.

Q. Okay.

A. Now wait a minute. Not unless—not unless there is a difference in heat there.

Q. A difference in heat that could be just natural from Mr. Kyllo being in his home and living there and nobody living in the surrounding structures?

A. Yes.

Q. Okay. So a totally natural living environment can be manipulated to be a heat anomaly, [211] correct? It can be called a heat anomaly?

A. I wouldn't call it that though.

Q. Well, you have called it that?

A. No. I believe I said that it was a difference in heat. I don't believe I ever used the word anomaly in the patterns that—

Q. Well, you're comparing.

MR. THOMSON: Your Honor, I'm going to ask that he be allowed to answer his question before counsel interrupts him.

THE COURT: Yes.

THE WITNESS: The patterns that were on the roof were definitely from that same roof, there were certain part of the roof that were obviously different than the rest of the roof. Certain areas of it that were warmer for no apparent reason. Exactly what is on the other side, I didn't know and I couldn't say exactly what it was.

BY MR. LERNER:

Q. Well, you did tell Officer Elliott it was consistent with a marijuana grow signatures that you had seen?

A. Yes.

Q. So you at least went that far?

A. Yes.

Q. And other people in your experience do jump [212] to those conclusions too?

A. Other people in my experience will quite often say that the marijuana grow is there.

Q. Okay. Thank you very much?

A. And that is incorrect.

* * * *

[DIRECT EXAMINATION
WILLIAM ELLIOTT]

* * * *

[261] from Sam shook where he used friends and family in order to set him him up with indoor marijuana grows. We developed information through one of Mr. Shook's ex-wife that he had recruited a number of his kids in particular Tova Shook and got her involved in that operation. We then received information from an informant that Tova lived in Florence and was currently living with a guy by the name of Larry. We did not know the last name at that time. We then—we subsequently made our inquiries and developed information that she was living with Larry Kyllo, Lori Kyllo and then we learned that Danny Kyllo also lived next door.

Q. And at some point during your investigation did you ask Detective Nafziger to get ahold of the Oregon State Police in Florence?

A. Yes, sir I did.

Q. I take it the addresses that you had for Tova Shook, Larry Kyllo, Lori Kyllo and and Danny Kyllo were all in Florence?

A. Yes, sir they were.

Q. Were they all part of this triplex that we've heard many some testimony about here?

A. Yes, sir. [262] The addresses were what?

A. 878 Rhododendron drive and890 Rhododendron Drive.

Q. And what exactly were you asking Detective Nafziger to do as part of the investigation?

A. To develop some basic background information regarding the subject in question, Tova Shook, Lori Shook and Danny Kyllo, I'm sorry,Larry Kyllo.

Q. And did you eventually have some direct contact with Detective Dorman yourself?

A. Yes, sir I did.

Q. What did you ask him to do?

A. Basically I was verifying the information that he had given to Detective Nafziger regarding the addresses who lived in the particular addresses and the vehicle associated with the addresses.

Q. So your initial contact with Detective Dorman was simply to verify information you already received through Detective Nafziger?

A. Yes, sir.

Q. Did you make some further requests of him to follow-up any of that information?

A. Yes, sir. I believe I made the request of him to contact the landowners to you know, get—to [263] ascertain through them exactly who was—who was living at the residence sees at the time.

* * * *

[275]

CARLOS LUIS GHIGLIOTTY RODRIGUES, JR., Defendant's witness, duly sworn.

THE CLERK: Please state your name for the record and spell your last name.

A.My name—my full name is Carlos Luis Ghigliotty Rodrigues, Jr. G-h-i-g-l-i-o-t-t-y

DIRECT EXAMINATION

BY MR. LERNER:

Q. Mr. Ghigliotty you have a long name?

A. Yes.

Q. For all purposes for business purposes do you just go by Carlos Ghigliotty?

A. That is correct.

Q. What is your business at the present time?

A. Name of the company is infrared technologies and we do infrared inspections and all types of applications related in

the field of infrared, including testing of infrared cameras, their limitations, they're capabilities, how these

* * * *

[280] Q. Okay. So you started a company where you provide thermal imaging consultation and assistance to other companies?

A. That is correct. And while I was at computer science I did that part-time also.

Q. Have you taken any instruction other than with the instruction that you—well, sounds like you got a lot of instruction in the military and through using this equipment?

A. Yes.

Q. Have you had any formal instruction?

A. Yes. I did go to a company named the Infraspection Institute in Vermont and I did attain a course there in 1987 and then I went and I was [281] level one and then I obtained a level two certification approximately 1991.

Q. What kind of organization is the Infraspection?

A. What they do is they train thermographers to us infrared for industrial application the not military, not covert, not R&D, just you know, the regular typical of day use of infrared imaging devices for electrical inspections, they train in dividuals for how to use different types of infrared cameras to perform infrared inspections, similar to roof moisture surveys, electrical inspections.

Q. Okay. So you took a couple of different courses at the Infraspection to—

A. That is correct.

Q. All right. And are they tied to any law enforcement agencies or anything like that?

A. Not to my knowledge.

Q. Are there other independent times of organizations that offer certification for thermographers that you know of?

A. Yes. There are a couple.

Q. And this was one of the ones that you chose?

[282] A. That is correct.

Q. All right.

MR. LERNER: Your Honor I have Defendant's Exhibit 116 which is Mr. Ghigliotty's professional resume, with the certifications attached. I would offer this to the Court. I have given a copy to the Government.

MR. THOMSON: I have received copies and I do not object to that document being received.

THE COURT: All right. I'll receive this document.

(Defendant's Exhibit No. 116 received.)

BY MR. LERNER:

Q. Mr. Ghigliotty, have you ever been asked to teach or provide any professional instruction at any seminars involving thermal energy?

A. Numerous times.

Q. Did you list some of those in the Exhibit 116?

A. Yes. There are a few there. Every year since 1991 there's a—IR/INFO which once a year you must be invited, you must have done something important to be invited to be a presenter or a speaker. And pretty much every year since '91 I have been there. I have also given lectures at Fort Belvouir and other agencies from time to time.

* * * *

[285] Q. So it's safe to say that you have had a broad range of experience with thermal imaging?

A. Yes.

Q. And how many different thermal imaging cameras have you become familiar with?

A. Probably over a hundred.

Q. Over time there have been—

A. Over time. And I have tested them, opened them apart, taken them apart, checked their specifications to see if they meet what the company claims that they say they are.

Q. Okay.

MR. LERNER: Your Honor I would offer Mr. Ghigliotty as an expert in thermal imaging and thermal imagery.

[286] BY MR. LERNER:

MR. THOMSON: I have no objection, Your Honor.

THE COURT: Okay. That's granted.

BY MR. LERNER

Q. Did you review some of the materials in this case, the Danny Kyllo case?

A. Every single line.

Q. Everything that I gave to you?

A. Yes, sir.

Q. And have you been asked to consult in other similar types of cases where infrared technology was being used in marijuana detection?

A. Yes.

Q. And as a result of your work did you prepare a report about the problems with the infrared, the thermal imaging in this case? Did you—did you prepare a report?

A. For this particular case.

Q. Yes?

A. Yes.

MR. LERNER: Your Honor, I have defendant's Exhibit 107 which is the original for the Court file and a copy for the Court which I would like to offer as an exhibit. In this case I have given the copy to the Government.

MR. THOMSON: Your Honor. I object. This

* * * *

[288] BY MR. LERNER:

Q. Mr. Ghigliotty, can you briefly explain to us what thermal energy is or what this thermal imager is detecting?

A. All objects that are inanimate or animate generate heat. That is part of the infrared spectrum. That energy is emitted in certain parts of the wave length. As we can see in the chart there.

Q. We have the charts here that has the electro magnetic spectrum on it; is that correct?

A. That is correct.

Q. And what does the electromagnetic spectrum represent?

A. What it represents is different part of the wavelength of different amount of energy that's emitted from different—from—being emitted in different forms.

Q. Okay. These are all waves that are transmitting through the atmosphere?

[289] A. That's correct.

Q. That can be detected detected?

A. That is correct.

Q. Here on the extreme right side we have radio waves?

A. Yes that is correct.

Q. One that lists UHF and one VHF is that similar to what we get on our television?

A. That is corrrect.

Q. Finally towards the center we come to the infrared range?

A. Yes that is correct.

Q. Closer to the left side you have the visible range?

A. That is correct.

Q. Then on the other side of the visible range there's ultra violet rays?

A. That is correct.

Q. Ultra violet rays are not visible?

A. They are not visible to us but there are certain senses just like in the infrared that can pick up some of that image.

Q. And beyond that are x-rays and gamma rays?

A. That is correct.

Q. And this chart then also blows up that area [290] of the visible to the infrared scale on the bottom?

A. That is correct.

Q. And the visible range is portrayed in colors that we normally would see in a rainbow?

A. That is correct.

Q. The numbers underneath here, the point 4.6.8 all the way up to 30, what are those?

A. Those are my microns.

Q. A micron is a measure—

A. Measurements. A measurement.

Q. And what is the infrared range that can be detected by infrared radiation?

A. Okay it will very - -

Q. By infrared cameras?

A. It's depends on how you see that. If we're talking about the thermal infrared, the heat sensitive infrared, it's three to five microns or three to 5.5 microns. And then the thermal part in the long wave infrared is anywhere from eight to 12 or 8 to 14 microns. Depending on the optics used, depending on the sensors used and depending on the coatings used on those objects.

Q. Okay?

A. Now there is a section there that's called a near infrared that we cannot see and that is not

[291] thermal. That is visible—visible—

Q. Scientifically it's called visible?

A. It's visible light but it's not visible to our eyes but it's after what we see, what we normally see and it's part of a near infrared spectrum. It's not - -

Q. You're talking about from .8 to about 1.5 or 2?

A. Up to 2.

Q. That would be part of the infrared spectrum but not thermal infrared?

A. That is correct.

Q. So thermal infrared can be detected by these thermal images?

A. Only—that is correct. And only if the thermal imagers operate in the near infrared

Q. Can it—are their detector that detect infrared in the far infrared?

A. Yes.

Q. And some people previously were talking about short wave and long wave, is that basically the same?

A. Yes.

Q. The near would be the short waive and the far would be the long wave?

[292] A. Yes. But that is in the thermal infrared. Don't confuse that little window there about the near infrared which is visible.

Q. This near infrared on the chart is somewhere between what I can see and between the thermal imaging range?

A. Yes.

Q. And this diagram indicates that thermography can actually go down to about two microns?

A. Depending on the camera.

Q. Okay.

A. The answers yes.

Q. Okay. How does the—I think we may have covered this with other witnesses but just for completeness. How does the thermal imager show us the thermal energy?

A. Well, that infrared image is collected through some sort of medium to optics and then it's collected to a detector and that detector will convert that energy into an electronic representation that can be viewed on a TV or videotape on some sort of mechanism to collect that data. It's not necessarily has to be video. It could be digital, digital recorder or some sort of recording medium. Anything.

* * * *

[294] Q. All right. But is the—in general the typical most common commercial use of thermal imaging to detect some kind of subsurface problem?

A. Yes.

Q. Can the operator of a thermal imaging device locate problems that are not visible to the human eye or obvious to the human eye?

A. Yes.

Q. And that's what you mean by nondestructive testing that you can test an object without destroying the object to see problems that you would not otherwise see?

A. That is correct.

Q. Can you give us some kind of maybe examples of in your experience what you have found say in just the building trades, how they would use thermal imaging?

[295] A. The most popular ones electrical inspections, roof moisture surveys.

Q. Roof moisture surveys?

A. Surveys. In electrical inspections what we're looking for are lose connections, corroded wires, phasing and balances. And properly connected wiring, circuit breakers that have bad internal contact.

Q. Uh-huh?

A. Things of that nature. Okay. And the idea.

Q. What are roof moisture surveys?

A. Roof moisture surveys, they can be done two ways. One is flying over and an airborne platform. The other is from the ground. What we're looking for is for the area where the roof is saturated with moisture. What happens is that when—there could be a blister on the roof or it was improperly installed, could be a warranty problem, could be age, could be anything. And what happens is was may leak into the roof. And then there are certain materials that insulate that building. And these insulating materials get saturated with moisture and then what happens is that they have no R value. Little or no R [296] value.

Q. R value is what is the thickness of installation that contains the heat in the building?

A. Yes, you might want to say that. Okay. And so then whether this occurs the building owner is spending a lot of additional dollars in energy to heat his building up because he's also heating the energy escaping where it shouldn't be escaping.

Q. And what about how can you determine if there are gaps in insulations inside the walls and things like that?

A. Yes. it's also used for steam surveys and also for insulation surveys around a building.

Q. And am I correct that the reason that this tells you that is because the materials are absorbing heat from underneath the surface and then emitting the energy out to the atmosphere?

A. Yes.

Q. So the information coming from the inside and then emitting to the outside?

A. Yes.

Q. Have you taken videotapes of some of this?

A. Yes.

Q. Have you brought some here to show the court?

* * * *

[301] Now that outline that we are currently seeing is the outline of the areas without the background image and then what I can do is take a CAD program and convert that image, that infrared image from rastor to vector and make a complete blueprint down to the inch and I can calculate the amount of square feet that is wet of the insulation. This will tell me once I go back on the roof and find out what the materials are made of, then I can calculate exactly how much it's going to cost to fix. Now, that is what we see now is the actual CAD program with the drawing on it. And in a second we will see the actual picture of the—there we go. That is the picture. And that is how we can determine where this insulation is bad and what areas need to be corrected. Now as you can clearly see, this—these areas of wet insulation appear very similar to any other type of anomaly that is being confused with some sort of grow operation. Now what we're seeing here is a videotape being played back inside the CAD program in real time and I am freezing that image. That is the same age image that we saw before. I invented that procedure.

* * * *

[303] I am playing back a videotape and at the same time I have a notebook which has a C D room and in the C D room it has a map of the United States with every street in it, ever telephone exchange in it and every zip code in it. So as I play back the tape it will plot on that notebook on the map my position off the videotape. I also have access to overlaying the taxpayers plot of the properties. Where he lives. So then I can play back the tape and I know exactly whose property I'm flying over. Now, I developed that system for—

Q. What did you do that makes this different or unique from other people?

A. The capability of playing back a videotape and plotting on a map.

Q. Okay?

A. Then I went one step further and I made interfaces to all mapping services including all defense mapping agency's and that gives me worldwide coverage.

Q. What do you do with these maps once you've plotted them?

A. Well, if I see anything ever interest on that [304] picture I can get a hard copy of the video and a hard copy of the map. All right. And then for example on this tape as we're—

Q. Can you pinpoint the precise location on the map where there might be a problem?

A. Actually within five centimeters. If I needed to do it.

Q. So this would be a tool for instance if you were working with the power company and they wanted to know if there was an electrical problem on a pool, you could actually give them a map of the exact street address where that pole would be located?

A. Absolutely. And here's a sample of that on that tape.

Q. This is all done because you have been able to interface the global positioning satellites with your overflight encode into your tape recorder?

A. That is correct.

Q. Okay.

* * * *

[307] Q. This image looks a lot clearer than the image we were seeing on the Agema 210?

A. Absolutely.

Q. This is a much better picture?

A. Yes.

Q. Are there reasons for that?

A. Yes. Because it has a larger detector. The size of the detector is much more larger. And the amount of elements in the detector are about half a million detectors. Or half a million pixels. That is a 512 by 512 array.

Q. Okay?

A. And what we're looking for is this. I'm just going to rewind this. See those hot spots there on that pole there. Some big humongous fuses on the top corner there. Those things have dirty connections and they blow. They generally will below. And then—

Q. These things up here on the top?

A. Yeah.

Q. Okay.

A. So what I have been able to do is combine the satellite conditioning, videotape mapping [308] program, infrared cameras put them altogether and play back on a videotape and be able to plot on a map.

Q. Okay?

A. The only one in the world that has been able to do that.

Q. Do you have any experience with the Agema 210?

A. Yes.

Q. What—have you tested it or used it side-by-side with other cameras?

A. Yes.

Q. Do you know whether it's being marketed through law enforcement?

A. Yes.

Q. In the experience in your other cases have you seen it's come up in other cases?

A. Yes.

Q. How much does the Agema 210 cost in relation to other types of thermal imagers?

A. It's on the low end pricing.

Q. And in terms of the quality of the imager itself, where does it fall?

A. At the low end of the spectrum. Very poor quality.

* * * *

[316] Thermal infrared systems are currently used by major law enforcement agencies and departments throughout the United States and have paid for themselves through asset seizures and successful major investigations.

Q. What page was that on in the materials?

A. Two.

Q. Okay. And how about page 3? Page 6. You don't have to put it on the display but you can just read it since the record isn't going to reflect since the Judge isn't here to read it.

MR. THOMSON: I'd like to see it. Can we have him put it up there?

A. Sure sure. I have got three of them.

Q. (By Mr. Lerner) On page 6, do you have page 6?

A. Yes, I do.

Q. Where it has structure proper files?

A. Yes.

Q. Paragraph 5?

A. It's right here. It's in the middle.

Q. Okay?

A. Okay. Page 6 it states that—

[317] Q. Can you read just from the center of that first paragraph? "Seized—where it starts "seized as a result."

A. Yes. Yeah. It is the beginning of the sentence. It says, "sezied as a result of successful search warrant was a

large indoor cannabis growing operation and over 3.3 million dollars in assets. Since that initial case in 1989 Federal, State and local law enforcement agencies throughout the United States have conducted thousands of similar structure profiles resulting in hundreds of successful investigations."

Q. Continue on. Wait. For example—

A. Where are we. "For example, in October of 1990 in Mojave Valley, Arizona two record-setting indoor cannabis grow—" can't read that.

Q. Grow sites?

A. Okay "Grow sites were found using a thermal infrared system. Again resulting in the seizure of multi-millions of dollars in ill-gotten assets."

Q. Okay.

A. There's one more.

Q. Mr. Ghigliotty—

A. Yes.

[318]

Q. May I get your attention. Page 1. Can you put it up on the display please. And reeled the third paragraph?

A. "Due to the complexity and expense of thermal infrared systems, numerous agency's considered thermal imaging a drain on already taxed budgets. However, with the new applications law enforcement soon found that these systems paid for themselves if applied by a properly trained and certified law enforcement thermographer. ".

Q. Okay. Thank you. I'd like to direct your attention to—I think that's all for this Exhibit right now.

MR. THOMSON: That completes you're offer of proof then.

MR. LERNER: That completes my offer of proof as to5 that. Are we in recess.

THE CLERK: You said as to that exhibit. Was that you're offer of proof.

MR. LERNER: That's what was objected to. I have continuing questions to ask the witness.

THE CLERK: That's all we want to know.

THE CLERK: Court's in recess. (Recess)

* * * *

[320] Q. Is it possible for thermal imagers to see through glass?

A. Yes.

Q. What types of thermal imagers can see through glass?

A. Any camera that works in the near infrared spectrum.

Q. The near infrared being the short wave spectrum of—in that lower you were saying 2 do 5 microns?

A. Yes.

Q. Are there any—is there anything about the lenses or windows that are used that further enable the short wave infrared cameras to pick up visible light and see through windows?

A. Yes.

Q. What would that be?

A. Depending on the detector and the window and the material that the window is made of or the lens is made of. It could be silicon. If it's silicon it will have a very high percentage of transmissivity.

Q. It will transmiss visible light?

A. Right through it, yes.

[321] Q. Have you made videotape for a Court exhibit of the ability of the Agema 210 to see through glass and other near short wave infrared cameras to see through that?

A. Yes.

Q. Is that on Exhibit 108?

A. Yes.

MR. LERNER: Your Honor, I'd like to ask permission to have Mr. Ghigliotty play that tape for the Court.

THE COURT: And that's granted.

MR. LERNER: Thank you.

Q. Okay. Can you just stop the action and tell us what's going on here?

A. This is an infrared image of a platinum silicide thermal imager.

Q. Who is operating the thermal imager?

A. I was operating it on a cart and then I walked to that. To the car.

Q. Was that you who got in the car?

A. That is correct.

Q. Okay. Continue.

A. Okay. (Tape playing)

Q. Stop now, the image behind the window of that car, it's that with the window down or with the [322] window up?

A. That is with the window up.

Q. So you can clearly see at least a figure in the car?

A. That is correct.

Q. Okay. Continue?

Q. Describe what's happening on the videotape for the record?

A. I am lowering the window so that the infrared imager can pickup only my infrared emission without—

Q. Through the open window?

A. Right.

Q. Okay. Continue, please?

A. I am raising the window halfway in between.

Q. Okay. And you can see yourself waving through the window?

A. That is correct.

Q. Okay. This is a test that you did to demonstrate that the infrared in the near short wave can see through glass?

A. That is correct.

Q. And this is just a standard car window of your car?

[323] A. That is correct. It was actually tinted.

Q. Okay?

A. And also this was done at night. Total darkness.

Q. Okay. Okay. Continue to play the tape. Have you done one of these with the Agema?

A. Yes.

Q. Now, what's the difference with this here?

A. This was taken at a different time, different settings, camera settings and we can still see through the glass the operator in this particular case is myself.

Q. This is not an Agema camera?

A. No.

Q. All right?

A. This is an Agema camera.

Q. Okay. Describe what's going on?

A. There's someone behind—let me rewind it. There's somebody standing behind the porch door. That is a glass. He is carefully, slowly opening the door.

Q. Stop. You can see the reflection in the glass there now?

A. Yes. There is a reflection of his infrared energy being reflected off the glass but at the same [324] time he is walking out of that porch door.

Q. Okay. Continue.

A. There's a reflection again. He's standing about a foot or so behind the door.

Q. Okay. And he's waving and you can clearly see his visible image behind the window?

A. That is correct.

Q. Is it your experience from these tests and from other opportunities to use near and infrared cameras that that is a common capability?

A. That is correct.

Q. Does the Agema company and other—do other companies that sell near end infrared cameras also market filters that will enhance the ability of the camera to see in that visible range?

A. Yes.

Q. Why are you getting such a clear visual image there?

A. Because the overlapping. The visible spectrum with the infrared spectrum. The theramal infrared. And you are getting an overlap on both spectrums.

Q. You're talking about what is the infrared or outside the visible eye range but still considered visible and not thermal infrared?

[325] A. That is correct

Q. So the optics of the camera do allow it to get into that range and not just pick up a thermal image?

A. Yes, sir.

Q. Does that work at night in the dark?

A. Yes, it does.

MR. LERNER: Your Honor I'd like to offer Exhibit 108. It's a tape recording of the capability of the Agema 210 to see through glass.

MR. THOMSON: May I ask a question in aid of objection.

THE COURT: Yes.

* * * *

[328] and I will play the tape back, continuously play this. This has the capability that everything around it the scene gets overloaded. The detector has no way of correcting this anomaly. All right. This is unacceptable and in the thermal—

Q. What is that called. Is there a term for it?

A. It's overloading itself.

Q. Okay. And that black area, is that typical in the higher or better quality machines?

A. No it is not.

Q. Why does the Agema do that?

A. Because of the way it was designed. It's a very simple camera, has 48 elements and the detector has no—the mechanism inside the camera has no way of correcting this. This is called anti-blooming or overloading. And this will allow the operator to possibly make a wrong conclusion of what he's looking at because it's—it not a complete—it not a proper infrared image.

* * * *

[330] A. This is a direct comparison, Thermovision 210 and this is a high resolution camera. Here we have—looking at the same scene, the same scene. Put four sides as closely as possible. They're parallel.

Q. Let me ask you some questions while you're standing there.

A. Go ahead and put this on pause because it's not on pause.

Q. Why is the image on the left so boxy and ill-defined compared to the one on the right?

A. Okay. Because this camera has a very small detector. And this one has—is a focal point array. Okay. This has a very large detector. Because it gives you a good—excellent picture. This one does not. Okay. That's one thing.

Q. Now, can you tell—well, go ahead -please?

A. Okay.

Q. Are you still explaining the boxiness of the picture?

A. Yes I want to explain some details. TV as [331] we normally see TV is 525 lines here. There's about six or seven lines that are used for decoding information. And the rest of it is being displayed. This detector is 512 lines by 512 lines. So if you multiply 512 by 512 it's 22,000 pixels or elements of detector. This one only has a few detectors. What they did here, the company did was that they stretched for every seven lines of video they amplified that detector so there's 48 elements—48 lines being displayed here into—converted into 336 lines.

Q. So its stretching out the information, not giving you complete information?

A. No. Not only that but we're missing information from here and down here. We don't have a complete TV picture. That's number one. Number two is when you play back the video TV it's 30 frames per second. You have 30 frames stacking—

Q. Is there a term for 30 frames?

A. Real time.

Q. That's like if we were walking and animating ourself and recording it to play back the same—with the same it would be 30 frames per second?

[332] A. That's correct. This camera cannot do that. It only plays at 15 frame a second. About half the speed of what normally it should be. Therefore you are recording or looking at half of the information. Exactly half—

Q. You're skipping a beat every time?

A. That's an excellent way of saying it. Okay. So now what we have seen is they electronically manipulated the detector. In all actuality this should be only—if you really want to see the way it should be it should be only seven lines here.

Q. Okay. So that explains why you get the boxy picture?

A. That's right.

Q. Because it's both expanding information that's recorded in abbreviated steps almost like a strobe?

A. Yes. That's exactly right.

Q. Can you explain why the two ladders look so different in the picture?

A. Yes. A couple of reasons. One is this obviously, as I explained before, has a very high resolution detector and we're seeing exactly what we're seeing. You know, we have a good [333] representation. This one is a poor representation of the image. And this here, this is—

Q. Describe what you mean by "this here." What you're pointing at?

A. What we are pointing to here is a ladder and it's made out of aluminum and it reflects. Okay. So it's looking hot when in reality it's not.

Q. That white spot in the middle of the ladder, the two diagonal lines is really a reflection rather than actual heat emission?

A. Yes. Because they're not here. (indicating) And these were taken simultaneously.

Q. I notice on the side of the building too there's kind of exaggeration of white as you go down the edge of the building actually different than the actual picture?

A. That is correct. This is the base of the house, of the structure, and this is the base of the house and structure.

Q. Is it difficult [sic-typical] to have that kind of warmth at the base of the house?

A. Yes. That's correct.

* * * *

[336] The important issue here is that two things are occurring. All infrared cameras can be manipulated to make a structure appear hotter than what it actually is. And therefore if the operator is not properly trained he can make false—he can make improper interpretation of his findings. If the camera has some sort of calibrating itself internally, like the one that they showed yesterday, then that cannot happen.

Q. Is that because the camera will always at least tell you what the temperature is regardless of how you're adjusting the knobs?

A. That is correct. That is correct.

This will take a couple of minutes because I'm going through all the settings and the same thing over here. And eventually you'll see this heat pattern being photographically exaggerated much more than it is now.

Q. You're pointing to the Agema?

A. That's right. This is the Agema 210. And this always happens whenever you use that camera.

* * * *

[339] BY MR. LERNER:

Q. So what we do know then about the Agema

equipment that was used in this case is it has no internal calibration so it can eliminate operator fudging?

A. Yes.

Q. And there's no way—is there any actual [340] ability to measure temperature so that they can determine something is really too hot?

A. No.

Q. Do other thermal imagers have that capability?

A. Yes.

Q. Would proper use of thermal imaging want—with an operator want to have some type of reference?

A. Yes.

Q. So a police officer for instance using the type of equipment would be free to make any adjustments that they wanted to?

A. Yes.

Q. And as you showed it, it's easy to over brighten the image?

A. Yes.

Q. And if the image was over-brightened or became whiter then it would appear to the operator that that target was hotter than it might otherwise be with another thermal imager?

A. Yes.

Q. Do different types of thermal imagers give a different image of the same targets?

A. Yes.

Q. Okay. Can you explain that a little bit?

[341] A. Depends on how it was built. As you saw a good example is that ladder there that I showed where you're looking at the same ladder from two different cameras and it gives you a different image.

Q. Okay?

A. And I can also—I have an overhead transparency to demonstrate that.

Q. Okay. Now, you have examined several different cases where the police are using thermal imagers to look for marijuana grows; is that right?

A. Yes.

Q. And is it common in your experience that they are using this to detect what they conclude are normal amounts of heat coming from a structure?

A. Yes.

Q. From your understanding from reading these various search warrant affidavits and things of that nature are the police interested in what's going on inside the house?

A. Yes.

Q. The conclusions I guess reached for are urged on—are based on the thermal imager telling them information that's emitted because there's too much heat in the structure; is that—

A. Yes.

[342] Q. Can the thermal imager be used to pinpoint or focus on a particular location in the house which might be the source of the heat?

A. Yes.

Q. Such as a back room or an attic or something like that?

A. Yes.

Q. The way that the police are using thermal imaging, is that consistent with what you would understand to be a scientific use of this type of equipment?

A. No.

Q. Why is that?

A. Because you cannot replicate or repeat your findings.

Q. That's one of the main reasons?

A. That's one of the main reasons.

Q. Meaning what, they don't keep track of what they're doing?

A. Well the camera has no way of repeating its initial findings number one and number two is some law enforce amount agencies do not videotape their findings.

Q. Are there standard procedures that make that a requirement in every case?

[343] A. Some state require that. Some of them don't. And as far as I'm concerned I—if I have—if I am doing an investigation I should be able to record my findings and provide them as proof of my findings.

Q. Is there a danger if there's no tape recording?

A. Yes.

MR. THOMSON: Your Honor I'm going to object. We've got a tape recording in this case. Why are we talking about cases where their aren't one.

THE COURT: Okay. He's answered the question. Ask the next question. And then wait for a minute and see if there's an objection.

MR. THOMSON: Okay.

BY MR. LERNER:

Q. Have you been involved in cases where there was no tape recording.

MR. THOMSON: Your Honor—

A. Yes.

MR. THOMSON: I—okay. I don't understand why this is relevant to this case. There's some other case where they used the thermal imagery that wasn't done properly, what does that have to do with this case. I think it's irrelevant.

[344] MR. LERNER: Has to do with the capability of thermal imaging, whether—Mr. Ghigliotty said that it can be manipulated and there is no videotape available. I think the Court needs to know that there are no procedures that require a tape. There is a tape in this case but their does not necessarily have to be a tape and that I think is an element of whether the Court would want to know whether this is search activities and when the Court should exercise some control over it so there are standards.

MR. THOMSON: Has nothing to do with the capability of the machine.

THE COURT: All right. I'll sustain the objection.

BY MR. LERNER:

Q. Without a videotape would it be possible to actually verify the accuracy of what a thermal imager was set to have—

A. No.

Q. —reveal?

A. Without calibrations or reporting of the settings is it possible to replicate or verify the agency of what is said to have been discovered through the thermal imaging? Almost impossible.

[345] Q. Is there anything that you found concerning to you as someone who is in the industry about the types of comparisons that were done in this case?

A. Can you repeat the question again.

Q. Is there something that bothers you as an expert in this field that bothers you about the way that the thermal imager was being used to compare Kyllo's home to the other—other structures?

A. They—

Q. Is that yes or no?

A. Yes.

Q. Okay. Now answer.

A. When a comparison is made to a reference structure they are saying that you should look at the house next door, the house next door or similar structure of that nature. Unfortunately all structures no matter how they are built next to each other, there all different. So there is no direct comparison structure or theory that can apply because the operator does not know and never will know what the materials are behind that house or the house adjacent to the one that there looking at.

Q. So are you saying that there's such a comparison would be misleading?

A. That is correct.

[346] Q. Have you yourself been in your business exposed to situations where very similar and close in proximity structures were actually quite different than their emission capability?

A. Yes.

Q. In a way that would be not apparent to the naked eye?

A. Yes.

Q. Can you explain that?

A. Yes. There have been instances for example a building contractor has built a hundred units, apartment units or town houses and they have gone bankrupt and then somebody else would buy them out and continue on the project. Then the—they don't schedule these people properly and people that need to put the insulation in the walls were not scheduled and then you have the drywall people, people that actually puts up the walls were not scheduled properly so the drywall people would come and put the walls on without any insulation in the building or in that apartment.

Q. From the outside those apartments all look the same?

A. Visibly, yes.

Q. But you discovered through thermal imaging [347] that they were not insulated?

A. That is correct.

Q. Have you discovered inhousing complexes where houses are close to each other that people sometimes insulate and sometimes don't insulate?

A. Yes.

Q. And is that apparent to the naked eye by just looking at the houses next to each other?

A. No.

Q. Are there any other inaccuracies that you have found in the way that the law enforcement is portraying thermal imaging in terms of whether it's passive and doesn't send out any emissions?

A. Yes. In all of the requests for search warrants they say that infrared is passive, it does not emit any rays of heat.

That is not true. In the report I have submitted some samples and I do have some samples on a video tape that I can present.

Q. What do you mean that it's not true? Does the thermal imager itself emits anything?

A. Yes.

Q. What does it emit?

A. Infrared radiation.

Q. How about the operator, does the operator emit anything?

[348] A. Yes he does. And he also -- she also emits infrared radiation.

Q. And is it possible for the targets area to reflect that radiation?

A. Yes.

Q. Is it possible for the thermal imager to distinguish whether it's picking up it's own reflected thermal image or when it is picking up the image from the targets?

A. No the camera cannot detect that or differentiate that.

Q. Have you ever seen this phenomenon at great heights like flying over places?

A. Yes.

Q. The thermal imager can pick up things of that nature?

A. Yes.

Q. How about the climate, does that have -- make a -- is that an important consideration for anyone doing a thermal image?

A. Yes.

Q. In what way?

A. There is something called atmospheric attenuation. Atmospheric attenuation is—can affect the performance of what is being looked at...

* * * *

[352] Q. Do you have videotapes of housing developments or common structures that show that?

A. Yes, I do.
Q. And you brought them with you?
A. Yes, I did.

MR. LERNER: Your Honor, we would ask permission to make a brief demonstration by showing that this is a very common fact that police are asked to interpret that that's a marijuana grow but that is very common in building structures.

MR. THOMSON: Your Honor may I ask a question in aid of objection.

THE COURT: Yes.

QUESTION IN AID OF OBJECTION

MR. THOMSON: Mr. Ghigliotty, now, if you were comparing two different structures would you expect to see something similar from each structure if there wasn't something creating a great deal of heat inside of one of those?

A. Could you repeat the question again.

MR. THOMSON: Sure. Let's say you're comparing two different structures. Would you expect that they [353] would have relatively the same kind of heat line along the base that you're talking about if there was no particular hot conditions inside of either one of the houses?

A. First of all I would never compare two similar structures.

Q. Well, let's assume you did for a moment. Would you expect them to be similar?

A. For what reason would I compare them?

Q. Because I'm asking you to.

A. I have been taught never to compare two similar structures because I know my data will never be the same. The reason being is this is insulation from one structure on the wall and it could be different on the other one.

Q. So you're not going to answer my question is what you're telling me. Would you expect them to be similar or not. If you want to say—

A. No. They're not similar. They never would be.
Q. So you wouldn't expect them to be similar?
A. No.
Q. Even if they were very similar construction?
A. That is correct.

* * * *

[356] BY MR. LERNER

Q. Have you been able to like find or inspect underground steam lines using infrared?
A. Yes.
Q. It's apparent because of the heat that radiates through the pavement?
A. Yes.
Q. In your opinion is the Agema 210 a reliable [357] instrument to use the way the law enforcement is using it?
A. No.
Q. And you've already gone through many of the reasons. Do you think that—are you aware of any standards of protocol within the law enforcement community that allow these things to be calibrated and repeated and not manipulated?
A. No. No.
Q. All right. And is it your opinion that using comparison structures without knowing what is in the other structures is misleading?
A. Yes.
Q. Do you have an opinion about when thermal imaging is invasive and invades people's privacy
A. Yes.
Q. What is your opinion?
A. That it does. As long as the camera operates in the near infrared spectrum one should be careful of what one does because there are instances that one can see right through glass as we just saw there and that is not right.

* * * *

[359] MR. THOMSON: Your Honor, I don't believe that I would be able to finish my cross-examination today. I would like the opportunity to digest the material that the defendant has submitted in his report I did not have before today's testimony. I would ask we have the opportunity to come back tomorrow and digest that report and allow me to prepare more completely for cross-examination.

THE COURT: Is there any objection to this Mr. Lerner.

MR. LERNER: I have no objection Your Honor. But I would like to for the record remember introduce Mr. Ghigliotty's reports since I think he has explained the contents of it and the pictures are still images of what are on the videotapes, I think they should go in the records and I haven't offered already I would like to offer Exhibit 103. I think it was offered and received.

THE CLERK: It was received.

THE COURT: 103's been received already already.

MR. LERNER: And the videotape 108, was that received.

THE CLERK: Yes.

MR. LERNER: All right. I think the only one that is still left would be the videotape—I'm

[360] sorry, the report of Mr. Ghigliotty, 107.

MR. THOMSON: Your Honor I have the same objections that I made earlier. It seems to us that's just another way of repeating what he's testifying to here and doesn't seem to be appropriate.

THE COURT: All right. I will receive his report. I don't think it will be harmful to the Government's case in receiving it and I think it would make the record clearer so I will receive it.

(Defendant's Exhibit 107received.)

MR. LERNER: Thank you.

THE COURT: All right.

MR. LERNER: I have no objection to recessing.

THE COURT: All right. And then we will reconvene tomorrow morning at 9 o'clock.

MR. THOMSON: Thank you, Your Honor.

THE COURT: We are in recess.

THE CLERK: This court is in recess.

* * * *

[459] [*CROSS-EXAMINATION BY MR. THOMSON*]

Q. All right. Now, I'm going to ask you to assume for a moment that a marijuana grow really would have high intensity lamps of a thousand watts or more. Is this a poor theory that the heat would be transmitted through the walls?

A. Depending on how the lamps were installed.

Q. And since you don't know how the lamps are installed you don't have an opinion about that?

A. (Pause)

Q. Well, you told us you've not been in a marijuana grow, right?

A. That's right.

Q. So you don't know how the lights are installed in the marijuana grow?

A. Yes, I do.

Q. Okay. How do you know that?

A. Because we have recreated a case in California and we requested that everything that was taken be brought back into the facility to recreate exactly the same conditions that it was as close as [460] possible when this inspection occurred. So I saw how they installed it. I work with electricity, I understand all the basics of that, and I understand exactly how the lamps work and I understand how they're connected.

Q. And you have to assume that whoever showed you how they were installed was setting them back up the way they were at the time the marijuana grow was in place?

A. Yes. I specifically told them to do that. We needed to recreate exactly the way it was.

Q. And is it on the basis of that one recreation that you dispute that the heat would transmit through the walls of the structure or the base of the building?

A. No.

Q. Okay. Do you dispute that?

A. No.

Q. All right. So why is the word "theorized" there rather than they—than some other word? Why didn't you just say that the heat would be transmitted through the walls of the structure and the base of the building?

A. Because it depends on the structure.

Q. All right.

[461] A. It could be heavily—so heavily insulated you never see that energy being transmitted through that wall. It would be transmitted someplace else, through another area.

Q. The theory is not a bad theory that use of high intensity lights is going to have heat transmitted through the walls?

A. No.

* * * *

[475] Q. You base part of your opinion that as to why the use of the Agema in this case was flawed was because there wasn't that imprinting on the tape?

A. Yes. Because when I do aerial surveys for environmental sensing, I put that information in there so that if the information goes to court it stands up in court.

Q. Well—

A. What I'm saying is I don't say that I was there and they take my word for it. That information gets encoded in the videotape and there is no way to contest it, period.

Q. So are you contesting that they did this when they said they were?

A. No.

Q. All right. So what's the problem with them writing on the tape that they have, that they made this tape at such-and-such a time and such-and-such a place on such-and-such a date? Why does that make their use of this flawed?

A. There's no—there's no actual proof that it was done at that particular time.

Q. The testimony is not good enough?

[476] A. Errors do happen. Can happen. Now, are there—

THE COURT: Is this a good place to stop?

MR. THOMSON: This would be a fine place.

THE COURT: All right. We'll take our noon recess.

MR. HINGSON: Your Honor, could I have some disclosure about how much more cross-examination is going to take place because it may turn out that events unfold I'll be able to attend to another matter?

THE COURT: Why don't you discuss it with counsel. I don't know.

We are in recess.

MR. THOMSON: Thank you, Your Honor.

THE CLERK: Court is in recess.

[477] *AFTERNOON SESSION*

THE CLERK: This court is now in session.

MR. THOMSON: Good afternoon, Your Honor.

THE COURT: Good afternoon.

MR. THOMSON: May I proceed, Your Honor?

THE COURT: Yes, you may.

BY MR. THOMSON:

Q. Mr. Ghigliotty, in your testimony yesterday and this morning you never addressed whether or not any thermal imaging device or thermal imaging camera can see through walls. Can you tell us, can it do that?

A. No.

Q. All right. And you have testified that under certain conditions with certain glass that some thermal imagers can actually detect images on the other side of glass?

A. Yes.

Q. And that is not always the case, is that true?

A. Yes. That is true.

Q. It depends on the glass that's involved and the camera that's involved?

A. Absolutely.

Q. And probably other things too?

[478] A. Absolutely.

Q. All right. And the Court saw when we had Agent Elliott walk out of the room and you saw the monitor as well, you couldn't see him through the glass in the doors in this courtroom, could you?

A. I wasn't paying attention at that time.

Q. All right. And you wouldn't expect if you'd gone out, for example, the door that's over here in front of the courtroom into the next room over on that side, we wouldn't be able to see anything but the wall, would we?

A. That's correct.

* * * *

[486] Q. I still don't think that you answered my question because I'm just trying to get an answer from you as to what time of the day you would expect to have the least amount of solar loading. That was my question?

A. During the day or the night?

Q. During the night. You said the night. I'm saying what time of the night?

A. It would depend on the latitude and longitude, where I was in the country and the longer I'm into the morning—the longer I'm into the night the least amount of solar loading, it will be in that structure. 2:00, 3:00 in the morning, 4:00 in the morning, 5:00 in the morning.

Q. So assuming that the Court believes the testimony that we've had here that Sergeant Haas did his thermal reading at 3:20 in the morning, would you—here in Oregon, at the Oregon coast, would you expect that there would be a large affect from the solar loading or a small affect?

A. At that particular time it would be a small affect.

Q. Thank you. I'd like to have you look at [487] your photographs that you developed. Well, before we move on I wanted to ask you one more question about this, maybe two more questions about these two photographs with the ladder up the side of the wall. Was this a metal building or not?

A. No.

Q. All right. And you indicate, see if you can follow it here, you indicate that the—what appears to be, I think you say, the heat spot is not—the heat spot is from reflection on the Agema camera. I think that's what you say here. Is that not correct? The heat spot on the ladder is a reflection?

A. Yes. Yes.

Q. Would it be more accurate to say what appears to be a heat spot is a reflection because there's a difference there, isn't there, between a hot spot and a reflection?

A. I would agree with you. I would said that—what I wrote there, I would have said, "What appears to be a hot spot is a reflection."

* * * *

[498] Q. No. It does not. Because I guess what I'm asking you is whether or not any power companies that you're aware of, and if you're not, just say that.

A. Uh-huh.

Q. Use cameras that of the same type as the Agema that do not measure temperatures to conduct these type of home surveys that you're indicating for energy loss.

MR. LERNER: Excuse me. We're talking the Agema 210 or some other type of—

MR. THOMSON: I'm just asking him about the qualitative type of machine at this point. I'll get to that later.

THE WITNESS: There could be some, but I'm not aware of any. I'm sure there could be some.

BY MR. THOMSON:

Q. And would that be useful in that type of a use to take a machine and look at a home to see if there appears to be areas that have excessive heat loss?

A. Yes.

Q. It may not be as accurate as the other machine but it could be useful, couldn't it?

A. Yes.

Q. And how have you used a qualitative type of machine?

[499] A. Many years ago when the quantitative machines were extremely expensive and not available, that is what I started working with, the qualitative machine.

Q. And was it useful for the work you were doing?

A. It gave some information but not enough.

Q. Not enough by what you consider to be the standard now?

A. That is correct.

Q. At that time you felt it was enough so that you were able to sell your service and use this type of machine, right?

A. Yes. But I also backed up my data with a radiometer that allows me to get temperature measurements.

Q. The point is that you have used and been paid for using a qualitative type of machine to do what kind of studies were you doing with that?

A. It varied.

Q. All right. Give us some—

A. Electrical inspections, roof moisture surveys, that would be about it.

Q. What was the first that you said?

A. Electrical inspections.

[500] Q. All right. And you would agree that they would also be useful for doing energy loss surveys?

A. Yes.

Q. Now, when you talked about the flaws of the Agema you mentioned the overloading and called that design flaw. Are you familiar with a term AC coupling?

A. Yes.

Q. And is that what the design is that causes that that you call overloading?

A. Yes.

Q. Can you try to explain that to the Court what AC coupling is?

A. Not particularly. It would be too complex. DC is two terms. DC restored and AC coupling.

Q. And is it because it's too hard to explain it or because you don't understand it that you don't want to get into that?

A. It's too hard to explain.

Q. Now, you testified that the Agema 210 does not have any kind of internal calibration?

A. Yes.

Q. Are you absolutely certain about that?

A. As far as I—yes. There's no—when I refer to internal calibration, internal blackbody

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[504] You also criticized the fact that the agents here have said that -- that the camera does not emit any rays?

A. That's correct.

Q. And you would agree, wouldn't you, that the Agema 210 was not designed to emit any rays as part of its operating system?

A. Could you repeat the question again?

Q. Yes. The Agema 210 was not designed to emit any rays as part of its operating system, was it? That's not how it measures thermal energy is by emitting some rays?

A. It's designed to measure the infrared radiation that is being received.

Q. Correct. It does not emit rays in order—

A. Yes, it does.

Q. You didn't let me finish my question?

A. Okay.

Q. Sure, you say it does. And so does every other article in the world, right? So that's your complaint is that we have to say everything emits [505] rays, right?

A. That is correct.

Q. Okay. And so let's agree upon that. But I want to ask you another question: Does that camera depend upon emitting rays in order to get a result?

A. Yes.

Q. It depends upon that? That's how it gets results?

A. No, no, no.

Q. That's what I'm asking. Does it have to emit some rays to get a result?

A. No.

Q. All right. Does any thermal imager have to emit anything to get a result?

A. Yes.

Q. They have to?

A. Depending on what you're looking at.

Q. All right. Now, are you talkin—maybe you can explain that to us since there are some of the cameras that measure heat, they actually send out something that measures the heat?

A. Okay. There are cameras that an infrared lazer beam can be connected directly to the camera.

Q. All right. Now, we're not talking about the Agema 210 when we're talking about an infrared [506] lazer beam, are we?

A. That is correct.

Q. All right. And the Agema 210 doesn't have anything like an infrared lazer beam that is emitted from the device?

A. No.

Q. All right.

A. But it is emitting its own infrared energy and the operator's infrared energy.

Q. We all understand that. You explained that. That's not my question.

A. Okay.

Q. What the question is, does that camera, does the Agema 210 depend on any kind of an emission in order to get a result?

A. No.

Q. And in that sense it passively collects what is being sent to it from its environment, isn't that true?

A. Yes.

Q. And what you're saying is that in order to make sure you have an accurate result, the operator should take into consideration the fact that the camera emits a ray and that emitting a ray?

A. Yes.

[507] Q. Not that the camera depends on that?

A.Yes. That's correct. Yes.

Q.And you heard the testimony that Sergeant Haas drove by in a vehicle with this Agema 210, did his thermal scan, correct?

A. Yes.

Q. do you have any opinion as to whether or not there would be any possibility that the readings he got were affected by any rays that were emitted by him, by his camera, by the vehicle that he was in?

A. Yes.

Q. And you can see that on the videotape?

A. I did not see any.

Q. Do you see any evidence that that's what is being fed back to the camera?

A. No.

Q. Would you expect to see some evidence of that if that was affecting the result?

A. It is possible.

Q. It's likely, isn't it? It's likely, isn't it?

A. Yes.

Q. So wouldn't it be fair to say that it's not likely that this result in this case was affected by any emissions from the camera or the officer or the [508] vehicle that he was in?

A. I will not conclude to that without making a complete analysis of the videotape. I was not called to do that. Analyze that frame by frame.

Q. You're not willing to say what you think the likelihood of that is?

A. No.

Q. Given what you've seen and given what you know about thermal imagery?

A. No. The reason being I made a videotape and I can prove that I am flying at a altitude of half a mile up and the reflection of the aircraft is clearly visible on the ground.

Q. Off of lakes, correct?

A. Off of lakes, that's correct.

Q. Now isn't it true that water is going to have more of a reflection and an airplane is a lot bigger than the car in a situation like that, wouldn't you expect there would be more likely you'd get some kind of result like that?

A. No. This was a small—these are small airplanes. Fairly small.

Q. The lake is not more reflective than a normal house?

A. It is.

* * * *

[513] So the closest control to the blackbody would be a person. The temperature varies a few degrees from skin temperature from person-to-person. So I would look at the person and set it so that I have a good picture and I would leave that—the buttons alone and I would go to the structure and look at it. Never ever touching those buttons again. Therefore I would have a good—I could then measure the amount, see the amount of energy, infrared energy being emitted from that structure, all right, and have some sort of a comparison.

Q. And so you're saying that you can't get a comparison with the Agema 210 to tell us what area is hotter than an adjacent area without having done what you just suggested?

A. Say again?

Q. I'm trying to find out because I thought you agreed to this earlier that the Agema 210 can at the very least give you an idea that some adjacent area is cooler than another?

A. Yes.

Q. And what you're concerned about is we can't say exactly how hot it is?

A. Yes.

Q. But it can tell us whether one area that's [514] being depicted is hotter than another, can it not?

A. Yes.

Q. Can you look at your No. 9 of the I think 14 or 15 because there's actually 16 things that you said were flaws in the way that this device was used in this case. Your reason No. 9. Say there, "When a suspect building or structure is inspected for hot spots, a direct comparison must be made with another identical structure to determine whether what is seen is an anomaly." Do you agree with that statement?

A. Yes.

Q. And yesterday you told me that you would never compare two structures?

A. That is right. Because there is no such thing as two identical structures. As we saw in the videotape yesterday, the apartment complexes, all of those apartments were supposedly identically built according to blueprints and they were not. There is no identical structure. There is no control structure.

Q. So you're saying that there's no way that you could ever use a device like the Agema 210 even though power companies are doing it and even though you've done it to make a comparison between [515] structures or even the same structure?

A. Could you continue reading the rest of the paragraph?

Q. I want you to answer my question first.

A. Could you repeat it again?

Q. You're saying that you can never use a device like the Agema 210 to make comparisons between structures?

A. If you do your data is going to be inaccurate. If you make a comparison with another similar structure without opening it up and looking what's in the walls and determining that it was exactly built, there is no way to accurately say that I made a comparison with two identical structures.

Q. I think I understand what you're saying but the comparison can still be useful in practical, common sense ways, can it not?

A. Yes.

Q. All right. The practical, common sense way as you've already indicated are used by different power companies and even yourself earlier on in your career?

A. Yes. But—fine.

* * * *

[524] Q. (BY MR. THOMSON) Is it your understanding from having reviewed this case that the—as you seem to indicate in some of your discussions here of the report, that this search warrant was obtained based solely on the thermal imaging that was done?

A. No.

Q. And from what you've indicated earlier we assume that there are high energy lights that are [525] being used to grow marijuana indoors, that there is a likelihood that there is going to be a high amount of heat conducted through the walls of a residence where high energy lights are being used. Is that right?

A. Yes.

Q. And that would cause, if we had two identical structures, I know you say there aren't two identical structures, but if we had two identical structures, that would cause one to appear to a thermal imager to be hotter than the other identical structure.

A. Yes. We're assuming there are two identical structures.

* * * *

[REDIRECT EXAMINATION—BY MR. LERNER]

* * * *

[546] Q. Thermal imagers cannot see through walls and doors; is that right?

A. That is right.

Q. They can only give you information about what might be radiating heat from behind the door?

A. Yes.

Q. Have you read anything in Agema literature that leads people to believe that it can see through windows and doors—I mean through buildings and doors?

A. Yes.

Q. Can you point to some of that literature?

A. they're are several places.

Q. I'm going to refer you to what's the Agema field evaluation of night vision equipment that's put out by the infrared, Agema Infrared Systems Company. Page 3.

A. Yes.

Q. Do you see that section says, "Searches in urban areas?"

A. Yes.

Q. Is there an area there in the middle of that first paragraph that implies that you can see [547] inside of a building

A. Yes.

Q. What does it say?

A. "For example, if an on besieged fugitive is inside a building or is concealed in a deeply shadowed area outside, very little may be seen of his position or actions. This is where a thermal viewer can be of value in detecting and observing activity from a position well back from the scene."

Q. And how about in the next paragraph, does it imply that you can tell if people are inside of a house just by them being inside of a house?

A. Yes.

Q. What does it say?

A. "It is interesting to note that the thermal viewer shows the distribution of heat radiating from various parts of a house. In a row of houses at night with no lights on, and it can be deduced that if a house was supposed to be unoccupied that any occupants present generating some heat might be detected by looking at the exterior house."

Q. The house exterior?

A. At the house exterior.

Q. So is that true that if people are inside of a house you can tell by the generation of their [548] body heat that they're inside the house?

A. That's not true.

* * * *

[553] Q. So there is technology out there that does screen the air for molecules that might show explosives in the air?

A. Yes.

Q. Is that what you're saying? And that technology could also be applied to thermal imaging in order to detect marijuana growing because there would be that type of signature from marijuana gases?

A. Yes. Not the exact piece of equipment but—

Q. Some adaptation?

A. Yes.

MR. LERNER: I don't have any other questions.

MR. THOMSON: I have just a few, Your Honor.

THE COURT: All right.

MR. THOMSON: I will not be very lengthy.

RECROSS-EXAMINATION

BY MR. THOMSON:

Q. Mr. Ghigliotty, your graph that you did when you examined the videotape that we have entered into evidence at the far end of the gain, as you call [554] it, it still shows that the surrounding area is hotter—it shows a difference in heat between the two areas on the videotape, does it not?

A. Yes.

Q. And it shows that both of the extremes that you examined and in your computer; is that correct?

A. Say again?

Q. I say both extremes that you examined with your computer and that you have depicted on the graph still show that

the conclusion that there are hotter areas than the surrounding area, that's still accurate; is it not?

A. No.

Q. You're saying it doesn't show a difference any longer?

A. Okay. If we look at the pictures—I'm going to go one-by-one. The top left picture has the camera with the contrast and brightness down to the minimum. I have one line driven across the hottest point which was seen at that time, that is the transformer, the electrical transformer. You can see the scale on the side on the left, the very minimum. Okay. Very—the peak is minimal. The picture that is labeled top right now has a cross here. I have a horizontal and vertical [555] line driven across. We're going do go to the line on the transformer. Now you can see that the energy or the image that is being displayed, the amount of gray scale has increased and has already touched the line. Okay. Now, on this picture, the same picture, top right picture, I have a line driven across the house. And then I have my graph on the bottom. And you can see the imaging—the image being peaked at the hottest point.

Q. I have your graph in front of me and—

A. Yes.

Q. —I guess my question is, doesn't—even when you did this analysis, doesn't the transformer show hotter than all the area around it in both of these?

A. There is a very minute—on the image on the top left it shows hotter, yes, as a minimum but you can see what happened when I drew the scale across it. On the top right it went all the way to the max.

Q. Are you telling us that this reading doesn't show that the transformer is hotter than the surrounding area?

A. Oh, it is hotter than the surrounding area.

[556] Q. You just confirmed what we concluded, didn't you, that the areas that show hot still show hot, they may not be as much of a difference, but there still hot, are they not?

A. Yes.

Q. All right.
A. Yes.
Q. And did you compare this to the other two houses? Did you use the same comparison to see if the other two houses, when you changed the gain, if they were still cooler than the house in the middle that we were concerned with?
A. Yes.
Q. And were they?
A. Were they cooler?
Q. Yes.
A. Yes.

* * * *

[561] *REDIRECT EXAMINATION*

BY MR. LERNER:

Q. You were asked just now about the photographs with the graphs and the dialing up and you can still see that things are hot. Isn't one of the problems that you're demonstrating in those photographs that it changes the relationship between the hot and the cold, it doesn't show the same relationships as you dial up and down?
A. Yes.
Q. So it does exaggerate how hot the hot is and how cold the cold is depending on where you set that dial?
A. Yes.
Q. Is that right? So that's your concern, not an exag geration?
A. Yes.
Q. And where the actual median should be?
A. Yes.
Q. When you were a sailor and you were looking for fallen bodies, are you comparing the bodies to one another or is it just obvious that there's a body on the ground?
A. Yes, it's obvious.
Q. Sort of like when you were—had your thermal imager tapes and you could see street signs and things likes that?

A. Yes.
Q. You didn't have to compare it to the wall? It wasn't a comparison type of thing?
A. No.
Q. It was just to see through the smoke so you could find a fallen body?
A. Yes.
Q. And that was under emergency circumstances?
A. Yes. If there's a fire there's a fire.
Q. In your experience in this area of thermal imaging has the technology been increasing and expanding?
A. Yes.
Q. Do you think that it's increasing at a snails pace or is it rapidly advancing?
A. No. Two years ago I thought that I would never see an imagine—or how can I say? Things that I dreamed about and thought of.
Q. People are actually inventing, operating on what their—
A. Let me explain this. Things I dreamed about and thought of that I would never see in my [563] lifetime I have seen them happen in two years. With this technology.
Q. So when you're talking about advances in the technology and the possibility of these kinds of detections, are you factoring in the advance of technology?
A. Yes.
Q. You didn't mean to say that today you can go out there and do this from a street corner?
A. Yes.
Q. But there might be a technical possibility not too far in the distant—in the near future?
A. Yes.
MR. LERNER: No further questions.
MR. THOMSON: No questions, Your Honor.

* * * *

[574] *DIRECT EXAMINATION*
CHARLES STOWELL

BY MR. THOMSON:

Q. Please tell us what your present occupation is, Mr. Stowell?

A. Yes, sir. I'm the program director for law enforcement systems and I'm employed by the Agema Infrared Company, 550 County Avenue, Secaucus, New Jersey.

Q. How long have you been employed there?

A. Since April 4th of 1994.

Q. Prior to that time were you a Special Agent with the Drug Enforcement Administration?

A. Yes, I was.

Q. And how long were you with the DEA?

A. 23 years, sir.

Q. During the time that you were with the Drug Enforcement Administration were you involved in training of federal narcotics officers in the use of thermal imaging devices?

A. Yes.

Q. And if you would, could you explain for the Court how you became involved in that and when you became involved in it?

A. I was fortunate enough to be -- to conduct [575] the initial investigation involving thermal imagery as regards to probable cause in a search warrant on April the 9th, 1989 in Los Angeles County, California. As a result of that case I conducted several other investigations during 1990, and at the beginning of 1991 it became obvious to all of us that a set of standards and protocol needed to be instilled in our training program for the use of thermal imagers of all types. Therefore, in January of 1991 I was appointed to a committee in Washington, D.C. to establish such standards and protocol for the use of the thermal imaging devices.

Q. Before you worked with the Drug Enforcement Administration had you been a police officer any place else?

A. Yes. Initially I was hired as a Los Angeles County Deputy Sheriff on March the 11th, 1963. And worked that job for approximately six years. Following that I was a special investigator or an investigator for the State of California, division of investigation, in Los Angeles, and subsequently a highway patrolman for the State of California.

[576] My entire law enforcement career until the time of my retirement spanned 31 years.

Q. During the time that you were a DEA officer, were you involved—DEA agent, I should say, were you involved in the California State Domestic Cannabis Suppression Program?

A. Yes.

Q. And what was your position there?

A. I was the statewide coordinator.

Q. Have you testified as an expert witness in both state and Federal Court regarding illegal cultivation of marijuana, possession of marijuana for sale and forward looking infrared and imaging devices?

A. Yes, sir.

Q. Have you participated in marijuana detection and eradication programs throughout the West Coast area?

A. Not only the West Coast but prior to my retirement practically throughout the nation and in several foreign countries.

Q. And have you received any particular training or instruction in detection and radication of marijuana growing and marijuana?

A. Yes, sir. I have over 200 hours of [577] specialized instruction in addition to all of the basic instruction.

Q. And have you also been involved in marijuana detection from fixed wing aircraft, helicopters and on the ground?

A. Yes, sir. I have in excess of 2,000 hours of such detection time.

Q. And have you been a pilot with the Drug Enforcement Administration Air Wave?

A. Yes, sir.

Q. Were you trained and certified on the forward looking infrared while you were a pilot for DEA?

A. Yes, sir.

Q. Have you also been involved in cooperative investigations in foreign countries?

A. Yes.

Q. Approximately how many and what type of investigations were you involved in?

A. I believe I was involved in seven or more foreign countries. I have been in actually more foreign countries than that, but actually involved in investigations in seven foreign countries, and have delivered lectures and seminars in others.

Q. And during the last five years have you [578] been involved in several seminars and conferences?

A. Yes.

Q. In what capacity, and if you have an estimate, how many?

A. May I refer to my notes for a moment?

Q. Sure.

A. In the last five years, which would include this last year, I have actually been involved in more seminars than are listed in my notes, but a conservative estimate would be that I have been an instructor in over 30 seminars and have given over 700 hours of instruction.

Q. And has some of this instruction specifically related to the forward looking infrared devices and thermal imaging devices?

A. Yes, sir.

Q. Have you actually participated in the use of thermal imaging devices in investigations that you've been involved with?

A. Yes.

Q. And approximately how many times, if you know?

A. In excess of 300 times I have been involved in the investigations using either airborne Flir or ground base thermal imaging.

[579] Q. And have you actually, in your instruction, certified for law enforcement purposes thermographers based upon the training that you have provided?

A. Yes.

Q. And approximately how many law enforcement thermograhers have you certified?

A. As of today it's just under 1,000.

MR. THOMSON: Your Honor, at this time I would ask the Court to declare Mr. Stowell an expert with regard to law enforcement use of the thermal imaging devices and thermal imaging as it relates to law enforcement.

THE COURT: All right.

Any objection to that?

MR. HINGSON: No.

MR. LERNER: No, Your Honor.

THE COURT: All right. I will and so decree that he is an expert in the law enforcement use of thermal imaging—

MR. THOMSON: Thank you, Your Honor.

THE COURT: thermal imaging devices.

BY MR. THOMSON:

Q. Can you tell the Court, you mentioned that you had been named to a committee to establish standards for law enforcement. Have there been some standards that have been approved by [580] the Attorney General's Office since you began your work at that committee?

A. I'm not certain if they were approved by the Attorney General's Office but they were approved by entities within the U.S. Justice Department.

Q. Can you explain the process that you went through to have your standards adopted?

A. Yes. In January of 1991 a committee of agents and supervisory officials from the Drug Enforcement Administration met in Washington, D.C. and formulated a basic curri culum for a training school in which law enforcement thermographers could be trained. Initially and due to all of

the documentation we had at that time, which was very limited, we decided that a 24-hour course, in other words 24 hours of courtroom instruction, accompanied by three examinations, would be conducted. We formulated the curriculum, we formulated the class hours, we formulated the Cadre of instructors and we submitted it to the General Counsel's Office of the Drug Enforcement Administration along—along with the Department of Justice for their approval. It was—our initial submission was [581] returned to us with some initial changes, those being the Justice Department was concerned that with each and every class a sitting or active assistant U.S. Attorney as well as if possible a state attorney could be possible to give a legal briefing to the class on the latest state of the law, as of the time of that class, and to instruct members of the class regarding court testimony as to the use of these devices. Once that was accomplished the course was then certified by the Drug Enforcement Administration and we began certifying—training and certifying thermographers.

Q. And did you specifically train Sergeant Haas, the National Guardsman who testified in this hearing?

A. Yes, sir. He attended a class that I gave at Camp Robinson in North Little Rock, Arkansas.

Q. And did he take the three tests that you just indicated that are required for your certification?

A. Yes, he did.

Q. What type of testing is involved?

A. The first two are practical tests. Typically the very first practical test is very [582] basic, how to take the equipment out of the case, how to assemble it, how to put it together, how to turn it on, what sort of image should be expected, how to troubleshoot if it doesn't work as advertised and it's—and it's very basic. Following that and within the same practical exercise emissivity, reflectivity, absorption and other issues relevant to thermal imaging are actually shown to the student thermographer so that he can see them and recognize them as part of his training. The second

practical exercise is usually given the following night. The first one is given at night. So is the second one. And the second practical exercise is usually a scenario wherein the class participants in building what we call in the class the wall of probable cause inserting each element in the construction of a thermal imaging case into its proper sequence with the last step being the thermal imaging. We setup a scenario wherein a building is artificially heated from the inside and a typical scenario would be a case scenario in which certain information was given to the class, they would then have to follow up on it and literally go to that site [583] and find the particular anomalies in heat patterns that we had set up. And following that there is a lengthy critique as to the structure of the case and the actual participation in the—in the practical portion of the thermal imaging. On the last day of the course all of the students are given a—I want to say 60 question, in some cases that's been expanded to a hundred questions. But they are given a written academic examination on what the class has taught them and having passed that examination, as well as the other two, they are then certified by the Drug Enforcement as a certified law enforcement thermographer.

Q. And did Sergeant Haas pass the test and get the certification that your course award?

A. Yes, he did.

Q. Can you tell the Court the protocol that you teach for using a thermal scan, correct me if that's not the right term?

A. Thermal scan is fine.

Q. How do you explain to the law enforcement officers to do a thermal scan?

A. Well, first of all they are admonished not to do a thermal scan of any type until certain other [584] elements in the case have been accomplished. This is done through a course of instruction within the class called building the wall of probable cause. The first bit of information or the first brick in that wall of probable cause is usually the same as any other narcotics case, it usually comes in as a tip from an in-

formant or a piece of information that the officer receives regarding criminal activity in which he may become involved as the investigator. The second step is then to use the normal indices and data bases that are available to law enforcement to check both the person's property and vehicles that may be involved. In other words, to find out what kind of playing field your on and who your dealing with is usually the second brick in the wall of probable cause. The third brick in the wall of probable cause is usually a multi utilities check. This may include electrical usage, water usage, natural gas usage, phone calls. Just normal gum shoe detective work that any policeman does prior to initiating any case. The next step—or the next brick in the wall of probable cause usually is surveillance of some sort. This may be a drive by during the daytime [585] just to verify that the address exists, to see whatever vehicles and people can be at the location or whatever. However, in some of the cases that we worked these people will be in very remote areas, their grow operation may be in the middle of a large tract of land, may be secluded from the highway and at that time the investigating officer has to make the decision as to whether or not they are going to proceed with the investigation. The surveillance portion of the investigation, and that is to actually fly over or go onto the property and conduct surveillance to see what they can see, hear what they can hear, smell what they can smell. This sort of plain basic surveillance. Following that and in conjunction with that many times we recommend that the imager be taken along. Especially if there's a fly over and the equipment is available. And if it is a ground surveillance, that a hand-held be taken to cooperate the other information they may see while they're there on the property. Following that there are usually some other checks that are accomplished. Let's see by that point all the criminal histories have been done, the physical work has been done, the initial [586] investigative work has been done. Following that we suggest to them8 to conduct other modes of investigation, i.e., trash searches

and/or additional fly overs, photographic missions, this sort of thing. And then once having done all of that, assimilate all of the information, not acting on any one particular piece, and present the case to a district attorney or a United States Attorney to see if they have all of the probable cause needed to present to a magistrate for issuance of a search warrant.

Q. Now assuming that you've gotten to the point or the officer has gotten to the point where he wants to use the thermal imager, can you tell the Court what protocol you teach as to how to actually use the thermal imager?

A. Yes. First of all, the very first and basic step is we have asked and the National Guard, for example, and over 70 law enforcement agencies nationwide have agreed that before a person ever picks up the imager and attempts to use it, that they first be certified through the DEA course. Because it is currently the only certification course offered for law enforcement thermography. In other words, don't even pick up the machine and turn it on unless [587] you're a certified thermographer. The second step is that the operator be familiar with that piece of equipment and be current in its use. Thirdly, the protocol is that the—if it is a law enforcement agent, that the operator be accompanied by at least one other person during the surveillance to corroborate the fact that the imager was used. In the case of a National Guardsman, that the National Guardsman be accompanied by at least one law enforcement officer who can direct his activities and supervise his activities during the actual thermal scan. Once at the location and in a perfect world the operator is advised that line of sight is very important between the imager and the object being scanned. That the scan be done as late at night as possible to eliminate the affects of solar loading. That the image be scanned or the object being scanned be scanned from as many angles and directions as is possible. And it has, although not required, it has been suggested by the United States attorneys involved in this—in advising us regarding the use of these particular instruments that a videotape [588]

recording be taken. That during the scan the operator scan the particular object or structure to be scanned as well as make comparisons of other structures of similar materials. In other words, you would not compare a metal barn against a single family stucco residence. And that is emphasized in the class, that the comparison be made of as nearly the same type and construction materials in a building as possible. During the scan the operator is told to full range whatever controls are on whatever camera he is working, take the brightness from its brightest aperture to its dimmest and the contrast from one extreme to the other; and while doing so obtain the optimum picture from which he then can make a judgment as to the image that he is seeing, whether or not there is an anomaly, whether or not there is something that bears further investigation or whether or not the location is negative.

Q. And do you also request or teach that if there is a control for reversing the polarity that they do that as well?

A. I probably have forgotten several of the protocols not having the training manual in front of me but, yes, we ask them while doing the scan to [589] reverse the polarity, in other words to make black the hot, and this is what we call the homework assignment. It's called doing their homework. They are checking the white hot items they have seen while the imager is in that mode against what they see when they reverse the polarity and see it in the black hot mode. And it is just a way of self-checking the image.

Q. Now, what's the purpose of teaching the thermographer to take the machine through the full range of contrast and brightness?

A. So that he, the operator, and if he is vidiotaping, the videotape will receive and contain the optimum picture that he was able to get of the object being scanned. In other words, I strongly disagree with some of the testimony that's come forward that you can make an object look hotter than it is. You can make an object look brighter than it is, but by doing that all the operator is trying to do is confirm and

receive the optimum picture from which he then can make a judgment. He's not trying to enhance anything, he's not trying to manipulate anything, he is just trying to obtain the optimum picture so that he can make a judgment.

* * * *

[592] Q. You're familiar with the Agema 210; is that correct?

A. I am.

Q. And is that, as we were talking with Mr. Ghigliotty, a qualitative as opposed to a quantitative camera?

A. It is. It does not measure temperature, therefore it's a qualitative machine.

Q. And is there any particular reason—well, let me strike that. Is that one of the thermal imagers that you have trained people to use through your DEA training and through your training now with Agema?

A. Yes, sir.

Q. And is there any particular reason why a law enforcement agency would wish to use a qualitative camera as opposed to one that measures temperatures?

A. Yes. Right now their—that is practically 99 percent of the thermal imagers available to and being utilized by law enforcement, are qualitative rather than quantitative. That reason is that we have absolutely no interest in what the actual temperature is. There are just too many [594] variables in building materials, in thicknesses of walls. I personally have investigated and done thermal imaging on homes that have been attempted to camouflage their indoor grows with up to 48 inches of insulation on the inside. There are just too many variables. In building materials, in ambient temperatures, in weather conditions and everything else. The only thing, and this is instructed ad nauseam in our class. The only thing law enforcement is interested in is the relative differences in temperatures and those heat anomalies that are visible through the imager.

Q. So if I understand what you're saying, all that you instruct is to try to compare the temperature reading with other parts of the structure or other structures?

A. That along with particular anomalies that are not evident anywhere else.

Q. Now, we heard some testimony yesterday and the day before from Mr. Ghigliotty that the Agema 210 has no internal calibration. Is that correct?

A. That's incorrect.

MR. HINGSON: If it please the Court, I believe that the qualification of the expert in this [594] case as to the use of thermal imaging in law enforcement does not extend to his knowledge of the internal workings of this complicated machine. Perhaps the Government can lay a foundation for the establishment that this person is an expert who is qualified to express an opinion in the area that the question contemplates. However, they have not done so at this stage so we object on the basis of lack of qualification of the individual to express an opinion.

MR. THOMSON: I'll try to establish a better foundation.

THE COURT: All right.

BY MR. THOMSON:

Q. Do you understand enough about the operation in the construction of the Agema 210 to tell us about the internal calibration?

A. I am not—I am not an engineer but from a layman's point of view, from a law enforcement point of view, and from the training I have received from the company, I believe that I do, yes, sir.

Q. So you've received some training from Agema as to what components there are in the Agema 210?

A. Yes, sir.

MR. THOMSON: Your Honor, with that I think that he can tell us what he's learned in his training [595] and that's what I would ask that he do. I don't think he necessarily has

to be an expert on this issue to tell us about that. We've received newspaper articles from the defense.

MR. HINGSON: Your Honor, there are two different questions that the Government asked the witness as to whether or not he was an expert, and the first one boiled down to essentially this: Are you an expert? And the second one was: Have you received some training with respect to this machine, and the answer was yes. But they have not go the further mile to show that what specifically that training was, and if, after they've shown us what that was, whether it contemplates the question that was posed. So I don't have any problem if the Government desires to proceed to determine what training the witness has had, but we are not at the point yet where the witness is competent to express an opinion with respect to internal workings of this machine.

THE COURT: Would you ask—inquire further, please.

MR. THOMSON: Certainly, Your Honor.

BY MR. THOMSON:

Q. What kind of training [596] have you received regarding the internal workings of the Agema 210?

A. I have received three formal briefings all of which took place at Agema headquarters in Secausus, New Jersey. Two were by design and research engineers, and the third was by the head of the Service Department or the technician who actually repairs the Agema 210.

Q. And what have you learned as to whether or not the Agema 210 has some internal calibration?

A. I was instructed while at Agema that the Agema model 210 does in fact have an internal calibration device. It is designed into the thermal electric cooler which is set to a base standard of zero. From there the machine is calibrated upon manufacturer, or at servicing, to within one-tenth of a degree Celsius. Having met that standard the camera is then put into production or use. If the camera—if the—excuse me, the thermal electric cooler within the camera fails to maintain

that one-tenth of a degree Celsius standard which is built into the camera, as an internal calibration device, the camera fails to work and the contrast goes to all black or to all white.

[597] In other words, it either images or it doesn't.

MR. THOMSON: Your Honor, does the Court have all the exhibits that the defense has put in? There's one, a memorandum from the National Guard dated 6 July, 1993. I don't have the exhibit number. I would like to refer to it.

THE COURT: All right. Why don't you come up here.

MR. THOMSON: Yes. This is it. It's Defendant's Exhibit 104A. May I approach the witness, Your Honor?

THE COURT: Yes.

BY MR. THOMSON:

Q. I'd like to show you Defendant's Exhibit 104A. This is a memorandum, says for The Adjutants General of all states and it's dated July 6, 1993.

A. I have a copy, yes.

Q. All right. Are you familiar with this memorandum?

A. I'm very familiar with this memorandum, sir.

Q. How did you gain familiarity with this memorandum?

A. In 1992 I was named by the National Guard [598] as the DEA representative to the National Guard Policy Board concerning policy for the use and investigation of thermal imaging devices. At that time the National Guard had purchased approximately 60 units of airborne thermal imaging devices and was contemplating a large purchase of hand-held imaging devices and they needed to know how to train their people and what policies law enforcement would accept regarding the use and application of the National Guard using these devices.

Q. Did you participate in writing the memorandum that's Exhibit 104 A?

A. Yes, I did, sir.

Q. How much participation did you have in that?

A. Quite a bit. Along with others on the committee wrote this entire memorandum for Mr. Bray's signature.

Q. I specifically want to direct your attention to Paragraph F that was referred to here during the testimony of Sergeant Haas.

A. Yes, sir.

Q. And that talks about not purchasing other devices from counter drug money other than the ones that are listed; is that correct?

[599] A. Yes, sir.

Q. And it doesn't include the Agema 210, does it?

A. No. But there's a ready explanation for that.

Q. What's the explanation?

A. The explanation is that the Agema model 210 is the civilian version, commercial version, whichever you would call it, available for purchase and sale to both commercial and law -- civilian law enforcement agencies. And the very first one there, the capital AN/PAS-18 followed by the letters W A S P is the military version of the Agema 210. It is exactly the same camera. It just comes in a different case, a rugged ice case for military use. It has exactly the same internal mechanisms, the exact same control devices. And that is the Agema 210 in military terminology.

Q. What was the point of that Paragraph F in the memorandum?

A. The reason Paragraph F is in this memorandum is so that we could eliminate two devices which were in use by the National Guard and civilian law enforcement at that time. The first device was the Probeye made by the Hughes Corporation, and the [600] second was the Tow and I don't know what that stands for, Tow Missile Site which was being used by the military. The reason we wanted both of these taken out of the inventory equipment being used by civilian law enforcement was that they gave a red or a bright red image when you looked through the imager rather than worked off the gray scale. And one of the standards and protocols we set

when we set the original committee was that we would only work with devices that worked from the gray scale.

Q. Now, you indicated that you have used thermal imaging in I believe you said over 300 occasions yourself?

A. Yes, sir.

Q. And have there been search warrants that have been obtained during those uses, and if you know, how many times you could share that with us?

A. I have used it for 300 times. Of those 300 times I called or it was my opinion that 47 of those were positive. Of those 47, 47 search warrants were issued and were served. Of the 47 search warrants that were issued, 44 did in fact reveal active, substantial Cannabis grow sites. That leaves the remaining three [601] investigations. Two of those three by the time we had got a search warrant written and had got there to serve it they had torn down the operation but it was not an active site. In other words, the lights, equipment and the other things were there but the narcotic evidence had been removed or a lot of the evidence had been torn down but they were confirmed as grow sites. And in one investigation in San Diego County I made no finding at all.

Q. You mean there was no either disassembled grow or active grow found?

A. That's correct.

Q. Now, in your experience in working with other officers that you have trained, have they had a similar success ratio?

A. Yes.

Q. Lastly, I'd like to ask you, have you reviewed the photographs, the videotape that was made and the diagram that was admitted here in court regarding the thermal scan that was done by Sergeant Haas on January 16th of 1992?

A. Yes.

Q. And do you have any—do you have enough information to form an opinion as to whether or not [602] his interpretation of that thermal scan is accurate?

A. Yes. I don't in any way, Your Honor, mean to be flippant, but this is a classic case. It is a heat anomaly in a building immediately adjoined by two similarly constructed, similar two-story buildings. This is—the procedures and the protocol that the sergeant followed were exemplary. The time of day followed by the other items, if there were any one case that I could point to where this was a perfect example of how thermal imaging could be used in a legal and ethical manner, this would be the one.

MR. THOMSON: I don't have any other questions.

THE COURT: And you may inquire.

MR. HINGSON: Thank you, Your Honor.

* * * *

[*CROSS-EXAMINATION*]

[608] It was aone of these schools we were talking about was being conducted in Seattle.

Q. Okay. And who was being trained at that school?

A. State and local law enforcement officials from the State of Washington. And it was attended by members of the industry.

Q. I take it that if Mr. Reck had signed up or wanted to pay money to get trained, you wouldn't train him?

A. No. The schools are limited only to active active law enforcement. And there is no money charged. It's part of the peace officers standards and training. There are no funds charged for this school.

Q. Okay. And private citizens can't go to such training programs?

A. That's correct.

Q. But industry representatives who manufacture the surveillance equipment can go?

A. That's correct.

Q. Now, while you were at that training school the issue of the testimony of Mr. Grover came up?

A. May I explain?

Q. Say again.

[609] A. May I explain?

Q. Possibly on redirect examination.

A. Okay. Yes, it came up. Yes.

Q. All right. Now, is it true that the—that you yourself expressed concern about his upcoming testimony?

A. I did.

Q. Representatives from Agema, Flir and ISI were present, correct?

A. Yes. The only reason I hesitated because I couldn't remember whether Inframetrics was there or not, but I don't believe they were at that school.

Q. Flir was definitely there, Agema was definitely there and ISI was definitely there.

Q. Who from Agema was there?

A. Bill Martin who was here and Phil Smith, the president of the company.

Q. Who from Flir was there?

A. I don't remember. There have been so many reps with Flir. I'm sorry, I don't recall.

Q. Okay. You expressed a desire to find out some background of expert Grover, correct?

A. Yes, sir.

Q. And the reason was because you were going to be facing him as an expert witness in the Reck, et [610] al case, correct?

A. Coincidentally, yes, sir.

Q. Now, the Judge asked you if you said at that meeting that it's important to turn his testimony around, correct?

A. I don't recall the specific questions the Judge asked me but—no, I don't recall. The transcript should be readily available. If that's what you're reading from.

Q. Do you recall Chief Justice Emeritus Karlton asking you these questions and giving these answers in that case: Question by his Honor: What did you say to the industry representatives?

Answer: We were holding a meeting regarding the thermal imaging seminar, and I asked them if they knew who a Mr. Paul Grover was. And if they were familiar with him and could anyone give me any background on the gentleman. Because he was going to face me as an expert witness today here in Sacramento.

Question: Are you aware of the June 24 conference in Long Beach, California?

Answer: Yes, sir, I'm conducting that conference.

[611] Question: You are hosting it?

Answer: Yes, that is correct, Your Honor.

Question: Did you ever say to anyone that it was important to turn this witness' testimony around or words to that effect?

Answer: No, sir. I will explain to you exactly what I said.

Question: You go ahead and do that.

Answer: We were discussing the fact that I was going to be facing a person from the industry who was going to give conflicting testimony and who had already written what I considered to be a declaration that was faulty on its face. I advised people present that I would like to know about his course, his training and that it was my exact words were that it was my wish that we not start a pissing contest between the Drug Enforcement Administration and the industry. Those were my exact words. It was suggested to me, I don't remember who with, why don't you give him a call. I said that has already been suggested by the Assistant United States Attorney, Samuel Wong, but I am not comfortable with that. Because of my 29 years of law enforcement, I have never contacted a witness who is [612] going to testify, you know, against me as an adversary, and I consider that witness tampering. There were several comments throughout the room, well, if you can't call him, we can. That was the end of that. And the meeting went on to other topics and discussions. Does that sounds like what your testimony was before his Honor back then?

A. Without reading it that sounds very similar to my testimony, yes, sir.

Q. Now, when you made the comments to Mr. Lerner off the record, you fully expected him to communicate your concerns to expert witness Ghigliotty, correct?

A. No, sir.

Q. Did you expect Mr. Learner to keep your word solely to himself and not act upon them at all?

A. At one time in my career I probably did, but I should know better any more the way the criminal bar is changing. It used to be that we could communicate from side to side and it would be held in confidence and not made a part of the record. That was my intent.

* * * *

[619] Q. And it's your understanding that a military fighters have been used in domestic marijuana investigations using thermal imaging devices?

A. Yes. But only under the National Guard. Never the active military and only under Title 32 versus Title 10. In support of law enforcement. Requested by law enforcement. Never ever unilaterally.

Q. In your—you have had a very long career in law enforcement and it appears that you've had your finger on the pulse beat of what's happening in the area of narcotics investigations, and will you agree with me that over the years that there has been an increase in the ability of law enforcement to rely upon the military for domestic law enforcement investigation of narcotics?

A. Absolutely, yes, sir. They have been a great asset.

Q. And there has been a benefit to law enforcement as a result of this cooperation?

A. Yes, sir.

* * * *

[621] Q. I want to make sure that we understand some terms.

A. Sure.

[622] Q. When the Agema 210 -- am I saying that right? Is it Agema?

A. It's Agema. You're saying it right. It's not Agema as your—as the previous witness stated.

Q. I have a problem with difficult names.

A. It is Agema and it is Gramalegi. Gramalegi (pronouncing) (Laughter)

Q. When the machine was taken out of the case and it was used in the Court, you'll agree it was being overtly used?

A. Yes.

Q. Now, when you're really using it in law enforcement to determine whether or not marijuana has been grown somewhere, will you agree with me that the appropriate protocol is to covertly use it?

A. I would agree with you 100 percent.

Q. All right. And you will agree with me that the way that you would use it is in the dead of the night?

A. Well, that has nothing to do with the covert purposes. That has to do with the practical purposes. You use it in the dead of night because youwant to eliminate solar loading.

Q. Sure.

[623] A. Yes.

Q. And if you were going to use it in a covert investigation you would want to make sure that the individual using it was dressed in a way that they would not readily announce there presence, correct?

A. Yes.

Q. You would want them to dress in dark clothing?

A. Well, clothing appropriate to whatever concealment method they were using.

Q. And under certain circumstances and applications you would want to have them put blackening agents on their face so that they would not be seen at all?

A. The younger agents enjoy doing that. I never did it but—

Q. That would not be inappropriate, correct?

A. It would not be inappropriate, no, sir.

Q. You certainly don't want to announce to the target that you're investigating them with this covert machinery?

A. That's correct. As in any surveillance activity.

* * * *

[638] Q. Can you tell me the sources of errors that can arise in law enforcement application of thermal imaging?

A. Certainly. Mainly in their enthusiasm to conduct an investigation the case officer will often, and this is one of the blocks of instruction within the current schools, will often eliminate the work which is required prior to a thermal scan. The thermal scans are done only after certain—the protocol calls for thermal scans to be done only after certain steps have been taken. [639] It's—it's easy for an—an officer to get a call at his office to say, for example, if farmer Brown has a huge Cannabis grow in his barn out on Albien Ridge, and with no more than that phone call, jump in his helicopter or call the National Guard and say, hey, we're going to go thermal scan tonight, we're going to go get thermal images. And this was the reason it was -- it was for some of those reasons that we in the Drug Enforcement Administration set up the original standards and protocol in 1991. But that's—that's a common one. Not obtaining an utility's check. In other words, trying to rely solely on the thermal scan as the basis for their search warrant which is not a proper protocol nor standard. The -- the thermal imaging is only one of the bricks in the wall of probable cause towards obtaining a search warrant.

Q. Let me refine my question a little bit so we can kind of focus on a different aspect of it.

A. Sure.

Q. I understand that these protocols that we don't have here require that all these other steps be taken that you referred to as regular old gum shoe work.

[640] A. Right.

Q. Just the hard work like law enforcement officers have to engage in in their jobs. But what I would like to focus on is what kind of operator error can occur when a law enforcement officer or a guardsman is using a thermal imager? What are the sources of error in using the machinery itself?

A. Well, I can only speak from a personal standpoint but I'll use some hypotheticals. Let's say an agent goes 90 or a hundred miles from his office and has forgotten to bring the battery with him. That's—that's an error. You can't—he can't scan because of that. Another one would be that he gets out and he's attempting to do a videotape of the scan that he's conducting, so he places the recorder, the video recorder in the pause mode for for more than 45 seconds which automatically shuts it down and you receive no videotape. I have heard of that happening. Forgetting to take the lens cap off was a big one for awhile. That was one of the basic errors. Everything would be in place and ready to go and the scan would take place and they'd come back, there would be absolutely no—no image and it was [641] because he forgot to take the lens cap off. Those are some of the basic ones that I can think of.

Q. Let me get to a little bit more specific to the issue of whether the machine is being used properly—

A. Sure.

Q. —to obtain the information.

A. Sure.

Q. One thing that you've mentioned that is necessary to scan surrounding similar structures?

A. Yes.

Q. If the operator didn't do that that could increase the likelihood of erroneous readings, correct?

A. Yes. Yes, I would agree with that statement.

Q. Let me, if I might, pose a question that contemplates the following: The site to be inspected by thermal imaging has no structures around it that are similar or even dissimilar. Can thermal imaging give accurate and reliable results in a law enforcement application under that sort of stand-alone circumstance?

A. That's one of the ethical dilemmas we have [642] faced. Very remote structures without anything near them. To date we have gone immediately to the nearest structure of similar building materials and used it as a comparison. However, once that is—once that becomes a problem or once that becomes an issue with us internally, usually there are other elements of the wall of probable cause, as I call it, which will be able to initiate the search warrant, and very little weight is given to the thermal scan.

Q. Could you get a reliable result by doing the thermal scan of a structure without having a comparison?

A. It's my opinion, I think so. I told you about when—I don't know which one of you asked me about the statistics. Out of the 300 or so scans I have personally done, I have called 47 of them positive. That leaves about 250 that were not used as probable cause in search warrants and some of them for the very issue that you've just outlined. I feel comfortable enough with the imaging equipment where I can make a reading but I have also let it be known that for weather conditions or lack of a structure to do a comparison to or something like that, and then very little weight is given to the scan. However, in each of the reports we note [643] the fact that a scan was—had been done, so.

Q. I was involved in a case that you may have heard about up here in Silverton and that was a case where a Tow missile site was used by Sergeant Haas' teacher. You being one of his teachers. His other teacher, Sergeant or Lieutenant, I can't remember his rank, Hauge. And he pointed the Tow Missile site at one barn and said it was really, really hot and did a search warrant and there wasn't any marijuana growing.

Have you heard of circumstances where those types of—let me call them false positives have occurred?

A. Yes,sir.

Q. Now, is there a centralized data collection protocol for collecting the information about when false positives have occurred in thermal imaging law enforcement applications?

A. You would have to ask the folks who are currently in authority in the Drug Enforcement Administration. I'm aware of that issue. I have pressed for that issue and currently just formed this month is an organization which will contain that data bank. But as of right now, I don't have any knowledge of any such data bank.

* * * *

[648] Q. Will you agree with me that a thermal imager can reveal, for instance, in a wall the fact that it has been disturbed?

A. Yes.

Q. And it will reveal the fact that the wall has been disturbed that is not apparent to the unaided eye?

A. That's correct.

Q. We've heard some testimony from, I believe it was Mr. Martin, that a thermal imager can see through quite well black plastic that would be used in the garbage bag industry. Were you here to hear that?

A. I don't know if I was in the—there are some—some thin coatings of silicone, if that's what the garbage bag is made of, that -- oh, wait a minute. That's what he said, if you constructed a house out of garbage bags you could probably see into [649] the interior, is that—I'm—that's all I recall about it, but there are some types of thin silicone which materials you can see through with an imager, yes, sir.

Q. Do you know if a thermal imager can see through visqueen?

A. You know, I have never tried it on visqueen. No, I don't know.

Q. Visqueen is black plastic substance used in—or some sort of black—isn't it black plastic? Visqueen?

A. White.

Q. Is it white?

A. White. I've never seen black visqueen. I have seen an awful lot of visqueen and it's all been white. Opaque white.

Q. Okay. You can't see through?

A. That's right. Well, it's opaque. It's not transparent but neither is it solid. If there where a shadow or light behind it you could see that, but you can't identify anything through it.

Q. Do you know whether a thermal imager can see through that substance?

A. No.

Q. Okay. When I was a youngster I had to work [650] in the concrete construction industry and I thought the black plastic stuff we put down on concrete foundations was called visqueen. Do you know what that's called, that black plastic that's used in construction?

A. I call it black plastic. When you say visqueen to me, we have a term in California the visqueen castles, and all during the summertime when we go up to do our overflights to detect Cannabis from the air we see these visqueen castles and the only one's I have ever seen, the plastic I have ever seen is white. There may well be black visqueen, I don't know.

Q. Well, let's talk about that black plastic that's used in construction. You know what I'm talking about, right?

A. Yes.

Q. You've seen it on walls and you've seen it in foundations and things of that nature?

A. Sure.

Q. Okay. Do you know whether a thermal imager can see through that?

A. No, sir.

Q. Do you know of any scientifically published research that collects what a thermal imager can look [651] through and what it can't look through?

A. I don't think that's done on a material by material basis. I think it—the only issue I have ever heard of is certain types of glass. So therefore the standard that I'm aware of is that it won't see through anything. But, you know, that it only takes a surface temperature.

Q. When I use that, I'm so sorry that I was in articulate when I used that question. I apologize?

A. Go ahead.

Q. When I was using the term "see through", what I was attempting say to you and I'm sorry I misspoke, can a thermal imager detect heat radiated through visqueen or black plastic or things of that nature and reveal details of the object on the other side of that barrier regarding the production of heat?

A. I don't know. I have never conducted that. I have heard of that being done but I have never done it. I have never seen it. And I don't know. I would imagine, just from the experience that I have had, that heat, once it radiates, is then absorbed by an object and reradiated out the other side. So which is what we're just talking about. But as far as black plastic and visqueen and all that, I don't [652] know.

Q. So under certain circumstances and applications thermal imaging may be invasive?

A. My answer to that has always been no, and will still be no. And I can explain my answer or you can let it stand as is.

Q. Well, I just want to ask, your answer is no even though you haven't surveyed the literature that may exist saying what a thermal imager may quote "see through," as I previously used that term, or not, correct?

A. Correct.

Q. Okay. Now, you have expressed the opinion in the past, have you not, that certain law enforcement officers improperly base conclusions on thermal imaging because they

were not certified, operating the equipment and they were not using the right equipment, right?

A. Yes.

Q. Would you explain to the Judge what led you to those opinions?

A. We had an incidence early in the—after my initial case in Los Angeles County there was a lot of media attention and a lot of attention brought to it in law enforcement. Coincidentally at about [653] the same time or shortly thereafter the National Guard began to receive equipment in their inventory which was capable of thermal imaging. They already had in their inventory Tow missile sites and Probeyes which were literally the Model A's of this technology and gave rather than a gray scale reading, gave a red image to the operator. We evaluated that equipment and found it to be unsuitable for our use. And the National Guard, for example, continued to use that equipment against our advice. There was an incident in the State of Michigan where a Tow missile site was literally bolted in an unauthorized fashion to the floor of a Huey helicopter and the intention of the unit flying it was to grid off the entire state and to fly this state in a grid pattern looking for quote "hot spots." First of all we're not big brothers, second of all that would have been a waste of taxpayers time and money and everything else, and it was an illegal—unauthorized piece of equipment. And that was—those were some of the reasons for the protocol and standards being given. The second incident which was unfortunately also involved the National Guard was a [654] captain in the National Guard out of upstate New York who the police officers asked him to go out and do an image which he went out and did by himself with no one accompanying him. Also with an unauthorized piece of equipment. He then went back, wrote his own affidavit and presented it to the Court. In other words, there was no peace officer involvement. So several federal and state laws were pressed to the limit of their tolerance.

* * * *

[656] The history in the State of Montana has been a total of three cases. The first two cases were done by an officer in the U.S. Forest Service who was not a certified law enforcement thermographer and he was using the Probeye which is one of the two pieces of equipment which we had found and the National Guard had agreed with were not authorized equipment with the red display. In his court testimony this particular Forest Service agent had testified that his piece of equipment was so good and he was such a good operator that he could literally see through the walls of buildings and see people having sex. All of which I knew to be incorrect. Therefore, when asked whether I agreed with those decisions by the Judge sitting in the incident case, which was done by a certified thermographer with the gray scale piece of equipment, I heartily agreed. The two earlier courts had decided correctly. In my opinion, sir.

Q. What is the range of the Agema machine?

A. The Agema 210 in its standard configuration [657] without any additional 2 X—there is a 2 X lens which comes with it, operates quite well for law enforcement purposes up to a half a mile. With the 2 X lens installed, one mile.

Q. Does your company have a financial interest in the use of this device and whether Courts around the land approve it or disapprove it, the warrantless use of it?

A. I answered that question earlier. And the answer is no. I mean they have a financial interest because they have sold to law enforcement.

MR. HINGSON: May I approach the witness, Your Honor?

THE COURT: Yes.

BY MR. HINGSON:

Q. Mr. Stowell, that was precisely the question that was asked you in the Seigel case and your answer was yes on page 155, correct?

A. Yes. And I'll certainly explain. May I explain?

THE COURT: Yes, you may explain.

THE WITNESS: Your Honor, if the ethical and legal use of thermal imaging equipment is found by the Court, or if the use of thermal imaging equipment is found to be ethical and legal by the [658] court, the Agema company, the Flir Company, ISI, Inframetrics and the other manufacturers will benefit because they will sell additional units. However, the moral answer that I'm trying to give is that if the Courts ultimately decide that a search warrant is necessary to use this equipment, the equipment will still continue to be—to be utilized by law enforcement because then they will obtain the probable cause to get a search warrant, use the equipment and then based on that duplicative effort of obtaining their ultimate search warrant for whatever structure they're searching. So, yes, there's an interest. If law enforcement flourishes the industry flourishes. But the final and bottom line to your question, sir, is that law enforcement, as far as I'm able to determine from all of the companies, is only about two to five percent of the infrared business. 95 percent of it is for commercial applications.

BY MR. HINGSON:

Q. Your company wants to see the law enforcement market expand, correct?

A. That's correct, sir, yes.

Q. To get it to more than two percent?

A. Yes, sir. That's why they hired me.

Q. That's legitimate. It's capitalism; is [659] that correct?

A. That's nothing I'm ashamed of.

Q. Sure. In September of 1989, specifically on September 6th, 1989, did you write quote, "You should know that the interest is also beginning to generate in the highly competitive thermal industry. The industry realizes that bad case law coming from an uncertified, untrained operator could adversely impact a large potential market." Did you write that in 1989?

A. Can you show me—

Q. Sure.

A. —where it came from?

Q. It was a question that was asked of you. Was that your answer on page 156 of the Seigel case from Montana? Right here.

A. It's the 1989—where does it say—

Q. Oh. Right up here.

A. (Pause) Those are my words. I don't believe the date's correct.

Q. Okay. What do you believe the date was?

A. I believe that was after I retired that I wrote that document. I believe you'll find that quoted in the documents you referred to yesterday, Thermal Imaging in the '90s.

[660] Q. It's important to you and your company that the case law develop that the use of thermal imaging is not a search, correct?

A. I'm sorry?

Q. It's important to you that case law develops that says that the use of thermal imaging is not an illegal search, correct?

A. Yes.

Q. Will you agree that in a—a row of houses at night with no lights on, that a thermal imaging device can provide information that can reasonably lead the observer to conclude that the home is occupied as opposed to unoccupied?

A. Yes, but.

Q. If two people were in the dark in a house in direct line of sight, if it were daytime, but unseen at night, and there was not a wall and there was not a window, will you agree with me that you could see an outline of a heat image of two individuals having sex?

A. No, sir.

Q. Pardon me?

A. No. I would not agree with that.

Q. Were you asked this question

MR. HINGSON: May I approach again, Your [661] Honor?

THE COURT: Yes.

MR. HINGSON: Your Honor, as long as I don't abuse the privilege—

THE COURT: Yes, you may.

MR. HINGSON: Okay.

THE COURT: Correct.

BY MR. HINGSON:

Q. In the Seigel case in Montana were you asked this question and did you give this answer: You stated on cross-examination that if two people were having sex that you could see an image of that, correct?

Answer: I reluctantly admitted to counsel that, yes, you can see the outline or a heat image of someone having sex if they were in a direct line, not through a window, not through a wall. Did you say that then?

A. Yes. You just asked me if they were inside a house.

Q. Okay.

A. That has nothing to do with being inside a structure.

Q. Okay. If two people were in the dark and not able to be seen by the eyes, okay?

A. (Nods head)

[662] Q. You could quote "see" close quote them having sex with a thermal imager, correct?

A. Go over that one more time.

Q. People are in the dark and they're outside?

A. Outside?

Q. Outside. They're in the Three Sisters wilderness area?

A. Right.

Q. And they've got a certified thermographer with a thermal imaging device?

A. Yes.

Q. And it so dark there's no moon and there's cloud cover?

A. Correct.

Q. And it's three in the morning and there 1 having sex. And as you look at night you cannot see these people having sex. Will you agree with me that a thermal imager pointed at those people could show that they were having sex?

A. If they weren't under a blanket, if they weren't behind some shrubbery, if they were out on bear ground in; the middle of—on say a grass lawn or something like that, in all honesty you probably could recognize the outlines of people embracing and depending on the movement you could possibly [663] tell. But you would only see—with two people in such close proximity together, you would only see one image.

Q. Now, let us change from the Three Sisters wilderness area to a residential structure on a hot August night with a window open because the people couldn't afford an air conditioner.

A. Gottcha.

Q. If you couldn't see into the bedroom with the eye, will you agree with me that you could see into the bedroom and see the unseen sex act taking place with the use of a thermal imager?

A. Probably not. Now, the window—in your hypothesis the window is open because they're trying to get air through the window, right?

Q. Sure.

A. There are just too many variables.

Q. Say that again?

A. There are just too many variables. Are there shear curtains, are thereis there a screen, is there a mere insect screen over the window?

Q. No, this is just a window.

A. No screen, no curtains, no—just the whole in the wall?

Q. Right.

[664] A. Could you see in there and see—you could—you could see in there and see, once again, the same shape that you would see out in the open, which would be one if they were embracing or—

Q. Well, without getting too graphic, people engage in different physical maneuvers and you can see people separated if they were, correct?

A. Yes.

Q. And joined and all combinations there of?

A. I'm not trying to be facetious but I said a while ago if you were familiar with these things and saw the movement you could probably ascertain in your mind that someone was involved in intimate activities. I say that grudgingly. You've got—you've got to be there and try it to see it. In the testimony of your expert, especially that scene of the apartments there, he kept saying you can see in people's windows. There was not one window you could see into except the one with the Christmas tree and that was because the heat from those bulbs was reradiating through the glass to the outside. And you could see that with the naked eye.

Q. Now, one of the things that you mentioned in your testimony was what was going on in Michigan with the placement of a thermal imager on the belly [665] of an aircraft—

A. No.

Q. Wasn't it on the belly?

A. No.

Q. Am I in the wrong state?

A. No, you're in the right state. I'll explain it again.

Q. Let me back up.

A. Okay.

Q. You said something about someone that had an idea of preparing a map, thermal map of an entire state?

A. Not a thermal map. A grid map. A standard map.

Q. Okay.

A. This was their plan. They—their cause is just in their hearts are true. However their legal ethics—not ethics but their legal knowledge is limited in the National Guard as to civilian law enforcement. They proposed to bolt the Tow Missile site in the door, in the open door of a huey helicopter, then they were going to to grid of the state and they were going to fly the entire state looking for quote "hot spots."

* * * *

[668] MR. HINGSON: I'm only asking him for the protocol. Whatever the protocol says. The overnment has not supplied us with it.

THE COURT: Well, if you're asking what the protocol is, I'll let you ask that.

BY MR. HINGSON:

Q. Okay. Does the protocol teach that?

A. The protocol teaches that—well, as I—as I understand it, if you were building a wall of probable cause say, for example, in a narcotics investigation—

Q. I'm a rookie, it's five years ago, I've been assigned to you, you're the king of all this stuff, teach me how to do it, I want to learn.

A. Okay. First of all you would never do the thermal imaging first.

Q. The rookie asks how come?

A. Because why, why go burn the kerosene and why go waste the taxpayers' money on gas and helicopter hours doing thermal imaging of what. First you need that piece of information. First you need that piece of information. And the example I [669] gave was farmer Brown growing marijuana out there in his barn on Albien Ridge, if you recall my testimony. Okay? All right. The problem was that it was fast becoming the second step, that officers were getting the tip and they were calling the guard, let's go image tonight. No, no. That's before the protocol waswas established. So

the protocol was established in the linear fashion that I gave you so that the—each brick in the wall of probable cause or each paragraph in the search warrant in trying to obtain probable cause was based on the previous brick. If you were to build a brick wall, and you'll have to visualize this in your mind, and you have that first brick down on the ground, and you try and lay the top brick next, when the minute the top brick leaves your hand it's going to fall. And that is the example given to the class. That they must build these cases using standard old tried and true police techniques. This is not a magic machine, it doesn't do things that—it's not some spy satellite in the sky, it just has its own particular brick in the wall probable cause.

Q. Does the protocol address the issue of [670] whether using the thermal imaging first is a search?

A. I believe it does but I—I'm not going to say we're going to find that in written documents. But that point is made time after time after time in the instructions.

Q. Does the protocol say if you don't follow this protocol you're not supposed to present thermal imaging information in application for a search warrant?

A. No. But I believe that's clear by the instruction.

Q. That's what they're taught?

A. Right. I mean you can teach any person to do anything a proper way and once you issued their diploma, certificate or whatever and they go on their way, then the choice becomes theirs.

* * * *

[680] Q. Do you know what a blackbody calibration source is?

A. Yes, sir.

Q. Would you tell me what that is?

A. That is an instrument used in a laboratory to calibrate the quantitative thermal imagers.

Q. Are they also contained in some qualitative thermo imagers? Or do you know?

A. It's beyond my expertise. I don't know.

Q. Okay. When you said that the Agema 210 has a calibration that is conducted in it, you were speaking of an entirely different thing than what a blackbody calibration source is, correct?

A. I believe so, yes.

Q. All right. The Agema calibration, putting that term in quotes, "Merely checks to make sure that the certain operating temperature of an internal component does not vary"; is that right?

A. That would be one way of putting it, yes.

Q. Okay. And the other types of devices that [681] have the blackbody calibration source actually test for the accuracy of what the device is testing, right?

A. I don't think they test for that. I think they test for accuracy of temperature measurements, but once again we're getting far beyond my expertise. I have never used a—

Q. To the best of your understanding, though, what the blackbody calibration source does is kind of like you and I synchronizing our watches?

A. Well, my understanding—no. My understanding of it is it's a reference point from which other things are measured.

Q. Okay. Excellent. And the Agema 210 doesn't do that?

A. With a blackbody, no. It has the internal calibration is in the thermal electric cooler which is as I testified earlier, set to within 1/10th of a degree Celsius, and if the cooler does not perform to that standard, the machine doesn't work.

Q. Right. And what the Agema does not do is it does not calibrate for the testing?

A. That's correct. Because it's a qualitative rather than a quantitative machine.

Q. Are you aware of how many people were [682] attempting to look into the background of Mr. Ghigliotty during and following his testimony?

A. No.

Q. Do you have any knowledge of that at all?

A. No.

Q. The final area that I want to talk about we touched on before but I would like to have you describe if you could with your words so that you paint a picture so that I can see with my mind's eye what you're talking about. You've talked about the protocols for thermal imaging in law enforcement that have been established by DEA?

A. Yes.

Q. Are those protocols contained in a book?

A. Yes.

Q. And is it a bound book?

A. No. It's a looseleaf binder and the title of it is the thermal—it's either Thermal Investigations Manual or Thermal Imaging Investigations Manual.

Q. Okay. And about how many pages is it?

A. The book is a living document and it constantly changes. I would estimate in excess of 100 and less than 200. But don't hold me to it.

[683] MR. HINGSON: Thank you, Mr. Stowell, I have no further questions of you.

MR. THOMSON: Your Honor, I have just a couple of areas I would like to have him clarify.

THE COURT: All right.

REDIRECT EXAMINATION

BY MR. THOMSON:

Q. One of the things you mentioned when Mr. Hingson was asking you about whether or not DEA has kept figures about the numbers of thermal imaging scans that have been done, is that you had a ballpark figure that has not been published but that you were aware of a ballpark figure?

A. I'm aware of a ballpark figure which I have been unable to confirm because it hasn't been published. Yes, sir.

Q. What's the ballpark figure that you're aware of?

A. In DEA alone, this does not count the number of thermal investigations that have been done by state and local

entities who have been trained by DEA, but in DEA alone there have been in excess of 350 thermal investigations done in the United States.

Q. And do you also have a ballpark figure on [684] the success ratio of those thermal scans?

A. Yes.

Q. Can you provide that information?

A. As I understand, and once again I want to clarify this, that it has not been verified or published, the terms that—the statistics that were given to me were that of the—well, first of all, 350 is a quote conservative number." Of those 350, 40—41 revealed non-active grows. All the rest were active. Of the remaining nine, it was either eight or nine, there was evidence that—of the remaining eight, of the remaining eight there was evidence of—that a grow had taken place but had been removed and there were two that there were no finding. And one of those with no finding is the one that I personally have knowledge of which was my case in San Diego.

Q. Thank you. You also indicated in response to Mr. Hingson's question, he asked you if you could tell if the thermal imager on a row of houses if one of the homes was occupied. I believe your answer was yes, but. What's the but?

A. The but is that it is not accepted as one of the nine current applications that law enforcement uses. But in the practical sense if you were to [685] drive through a neighborhood in the middle of the night and scan the homes, let's say you scanned the first four homes that you came to, you would be able to see, for example, if utilities were on, furnaces were on, this sort of thing, indicating that the houses were occupied. You're not looking for people. You're not attempting to peer through the walls and see bodies. You're just looking for—the background of that application came in what we call fugitive searches or kidnap situations where someone has gone into a structure, secreted themselves inside and there may be a hostage situation, there may be a kidnap or there

may just be a plain fugitive wanted by the law inside that residence. We were asked in a theoretical way if we could scan the house and tell if it were occupied. The only way we could scan the house and tell if it were occupied were to look for the normal signs of occupation, heat, air conditioners, vents active, this sort of thing.

Q. Thank you. Mr. Hingson was also asking you about visqueen, black plastic and other materials that may or may not be transmissive to thermal energy, and I believe his question to you was that if you could—assuming that some things like the trash

[686] bags that Mr. Martin testified to are highly transmissive to thermal energy, doesn't that convince you that it's invasive. I believe your question was—or your answer was that you didn't believe that was invasive, but you weren't given an opportunity to explain that. Could you explain it?

A. Well, you would have to use the scenario that Mr. Martin used in his—in his testimony. If people's homes were constructed of garbage bags or visqueen, this whole issue would be moot. If you can see through it. See, I have no personal knowledge. I've never conducted that experiment. But if you had a house constructed of sheets of garbage bags or this visqueen and you could see through it, it would be a whole different ball game. I would think it would be just as easy to see through it with the naked eye. But I don't know.

Q. You also, when you were testifying about the statement that was made about Mr. Grover being a witness in the Gramalegi case that you would like to explain and I believe Mr. Hingson said you can explain that on redirect.

A. Yes.

Q. I'd like you to explain it.

A. Yes. We were having this school in [687] Seattle, Washington and members of the industry were present. I was the DEA coordinator for the school. Perhaps I wasn't the coordinator, I was the instructor. Coincidentally at the same time I was about to appear in Federal Court in Sacramento

before Judge Lawrence Karlton in a hearing on the issue of thermal imaging. I had been told by the Assistant United States Attorney that an individual by the name of Paul Grover was going to appear for the defense. I was—as many times over the years as I have been in court I was a little anxious because I wanted to be professional, I wanted to be totally prepared. So I wanted to get some background information. The United States Attorney suggested I call Mr. Grover and just talk to him on the telephone, and I was real uncomfortable with that. I didn't feel that I should do that and I told him so. And he said well, then don't if you're uncomfortable. He said you know, but we need some background information on this guy. Well, who better to ask, and we had all the people present there in Seattle, and I asked who was Paul Grover, did anyone know him. They all knew him. And I said and what will he be bringing to the table as far as testimony and expertise when he appears in [688] this case in Sacramento. Thereafter, when I—when I told the assembled people from the industry that Mr. Grover was going to appear, several of them got angry. You know, comments were heard like how could he do that to the industry, how could he -- you know, and then when I made the comments which was referred to by the attorney. I said I don't want to start problems, that isn't the verbiage I used, between the industry and law enforcement, I said I just need some background information on this guy. Well, unbeknownst to me, and it's clear in the transcript in Judge Karlton's court, someone from that meeting evidently called him and they didn't threaten him but they asked him, you know, why the heck are you betraying the industry that you're in by appearing as a defense witness. Mr. Grover took that as a threat or an intimidation. So he wrote Judge Lawrence Karlton a letter prior to appearing and said that this person, who has since passed away, had threatened him and—and—not had threatened him but had intimidated him and he was concerned about coming to Sacramento to testify.

Well, he did come to Sacramento, he did testify. All of this was cleared up in a hearing.

[689] He said that he really hadn't been threatened, he just had an argument with this man over the telephone. I didn't know about any of this, Your Honor. I wasn't a party to any of it. The only thing I had done was attempted to get some background information so I could be prepared for his testimony. The Judge called me to the stand and personally questioned me at length and it's all a matter of record on the transcripts. But as far as I'm concerned, once we clarified all that to Judge Karlton it became a non-event. Mr. Grover went on, testified for two days that I remember and left.

Q. I have just one last question. You also were asked about a statement that you made in some document that you in 1985 had been certified by Flir to operate some of their equipment and this was in reference to some testimony that you gave in Montana in January. Can you explain your answer there?

A. Yes. The Drug Enforcement Administration had purchased four airplanes equipped with Flir 1,000 forward looking infrared devices. They had been purchased by Congress, DEA pilots were to fly them to South America and aid in particular the Government of Columbia in discovering cocaine labs out in the jungle.

[690] In order to operate that equipment we were told by authorities at the Drug Enforcement Administration that we would have to be certified in the equipment. All of us were pilots at the time. We had to pass all the necessary flight checks. And then we were told that the FAA certification required us to know the equipment on board the airplane. Therefore, Flir sent down technicians in how to operate the equipment and a three-day, very detailed, very technical class was held. We were told verbally at the end of that that we were now certified thermographers. We looked around at each other and said, you know, "we are?" So I never received a certificate. We were certified thermographers all right and

it's like the first day on the job as a rookie cop, you are one but you don't know what you are doing.

Q. So you were certified to operate that particular piece of equipment?

A. That's correct, sir.

MR. THOMSON: That's all the questions I have.

MR. HINGSON: Your Honor, I have just a brief recross.

THE COURT: All right. Go ahead. Hurry.

[691] I promised Judge Marsh—

MR. HINGSON: All right. Could you help me with some defense exhibits while I ask some questions? It's a newspaper article I want. Great. Perfect. I see it.

RECROSS-EXAMINATION

BY MR. HINGSON:

Q. I'm showing you Defendant's Exhibit 114 and I'd like for you to read this paragraph to yourself.

A. (Pause-complying) I have read it, sir.

Q. All right. Now, this is a statement by a competitor of yours?

A. Yes.

Q. Flir.

A. Flir Systems here in Portland.

Q. And they said that an Flir device could detect money belts worn around the waist of a passenger?

A. That's what the article said.

Q. Do you disagree with that?

MR. THOMSON: I'm going to object to this. This has nothing to do with my redirect examination.

It's outside the scope.

[692] MR. HINGSON: I believe it certainly is not outside the scope. I think it had to do with the capacity of the device. Asks questions about the home and what it could see and what it couldn't see. This is the same topic, the capacity of the device.

MR. THOMSON: That's what I asked on direct examination but we didn't get into that on redirect. I had some very specific questions that don't relate do any of this.

MR. HINGSON: I hate to further delay this, Your Honor, but—

THE COURT: Go ahead. Overruled.

BY MR. HINGSON:

Q. Do you disagree with that statement by the Flir president? Is it president?

A. I disagree with whoever made the statement.

Q. Okay. You said that there are nine purposes for the use of thermal imaging in law enforcement?

A. Yes.

Q. Is that contained in the United States Code somewhere?

A. No.

Q. Is it contained in any statute?

A. No.

* * * *

[694] Q. Okay. And would you agree with me that although people don't build their houses with black plastic unless their homeless people and living underneath a bridge. By the way, some people do make their little homes like that, don't they?

A. Yes, they do.

Q. And you agree with me that sometimes when we have a natural disaster or a hurricane, or a tree falling through someones home, sometimes people put up black plastic to keep the elements out of their home while repairs are going to be conducted?

A. Usually you see—I've never seen black. I have seen a lot of the blue plastic which is the water repellent plastic.

MR. HINGSON: I have no further questions. Thank you, Your Honor.

MR. THOMSON: No further questions, Your Honor.

* * * *

[729] All right. I'll hear the Government's objection to his testimony. Then I'll make a ruling on that.

MR. THOMSON: Yes, Your Honor. It's my understanding that the witness Mr. Lerner intends to call—

THE COURT: Is that Mr. Wilson?

MR. THOMSON: No, that's the Government's witness.

THE COURT: Oh, okay.

MR. THOMSON: The witness' name I don't know.

MR. LERNER: The witness that I would like to call is Michael McDowell, Your Honor.

MR. THOMSON: Mr. McDowell, my understanding is, Your Honor, is a resident of the State of Washington who's home was searched pursuant [730] to a search warrant issued in Washington back in 1992 in Watkin County, Washington, and at least part of the information that was provided in that search warrant involved a flyover with a thermal imager. And Mr. McDowell, I understand, would testify that there was no marijuana growing in his residence at any time. So obviously if that's correct then there was some kind of a mistake made in the thermal imaging reading. Your Honor, we would object to the entire line of questioning as being irrelevant to this proceeding. We don't have any idea what procedures were followed. This—that certainly doesn't relate to this case. There's no suggestion that any of the same people were involved, that it was the same device that was used or that it was used in the same way that the device was used in this case. So we think it's totally irrelevant. I mean we could be here forever if we brought in people that were involved in other thermal imaging cases. The Government could produce testimony of our own that yes there have been mistakes made. So we're not trying to claim that this is an absolutely foolproof technology, and I think we could say [731] that about just about everything we do. But we think this is totally irrelevant.

MR. LERNER: Your Honor, I apologize, this is going longer than we all anticipated. But I think it is relevant and it's relevant for this reason: First of all—the Government opened the door by claiming that out of all the thermal imagers that the DEA has done and Mr. Stowell was the individual who claimed personal knowledge about all of them as the basic clearing house, that there are three times that they did not find a marijuana grow and in two of those times they found evidence of a prior marijuana grow, and only one time in San Diego there was no finding. This individual's house was searched with a search warrant that was based upon a mentally—on a thermal image conducted by the D.E.A. This is one that Mr. Stowell should have known about. It was close in time to Mr. Kyllo's case because it happened in May of 1992. The application for the search warrant does not disclose the type of machine they were using and the tape record that we have of the thermal image itself is here for the Court to review. But I think it's also for the Court of Appeals if it goes that [732] far, should have that record. Mr. McDowell is here to testify that he didn't no why they were searching his home. He was upset about it and hired a lawyer to find out why they got a search warrant on his house. And that's how he obtained the transcript of the search warrant proceedings. And that's when he learned that there was a thermal image done on his property, and then he got a copy of that tape recording. And once he viewed the videotape, he himself did a diagram of the area based on what the thermal image what was showing and went to the outbuilding that they claimed was hot, and has a videotape that he personally took of these shacks with no windows where there's no power source and they're overgrown by blackberries. And it's our assertion here that this stuff can be manipulated, that here's an example of how a claim can be made to invade somebody's house based on just somebody looking at the videotape and saying they think it's hot, their judgment, and that these judgments ought to be controlled. And that this is an issue of privacy, an

issue of whether thermal imaging is capable of doing what the Government says and whether it does invade people's privacy unnecessarily and whether it is [733] precise enough that the Court should allow them in search warrants without prior visual authorization. I think it's relevant to rebut Mr. Stowell. I think it's relevant to show the likelihood of mistakes far beyond what Mr. Stowell attempted to portray. And I think it's relevant to show how the thermal imager does result in manipulation in order to get search warrants and resulting in the invasion of innocent people's privacy.

THE COURT: Do you wish to be heard any further, Mr. Thomson?

MR. THOMSON: I don't think it's necessary, Your Honor. I think we've made my arguments.

THE COURT: All right. I will take this matter under advisement and we are in recess.

MR. LERNER: Okay. Should we come back at 1:30, Your Honor?

THE COURT: Is there anything further to present at 1:30 at this time?

MR. LERNER: Only Mr. McDowell. Who has come from Washington. He lives in Bellingham.

THE COURT: All right. We will reconvene at 1:30.

MR. LERNER: Okay. Thank you.

THE CLERK: Court's in recess.

[734] THE COURT: Oh, counsel, we will reconvene at 2:00. 2:00 instead of 1:30.

MR. LERNER: Thank you.

(Recess)

THE CLERK: Court is now in session.

MR. THOMSON: Good afternoon, Your Honor.

THE COURT: Good afternoon.

MR. LERNER: Good afternoon.

Your Honor, may we call our witness?

THE COURT: Well, counsel, I have spent considerable time on this and, as I understand it now, the issue on remand

relates to the technological capacities of the thermal imaging device used in this specific case. Now, the Court going to sustain the Government's objection to the testimony of Mr. McDowell regarding the use of thermal imaging under other circumstances in another instance. Now, I do understand that mistakes can be made in interpreting the information obtained with the thermal imaging device. However, examining the use of thermal imaging in another case is not relevant because it's not helpful to the Court on the specific issues to be decided in this case. As to further evidence and testimony [735] regarding Mr. Ghigliotty: You know, I understood his testimony and I am able to evaluate his testimony as it relates to the issue of the technological capacities of the thermal imaging device. Further testimony that relates to the general credibility of Mr. Ghigliotty is of limited assistance to the Court. However, I will give both sides the opportunity to decide whether further evidence and live testimony must be offered in this case. And so I will give you until—to notify me in writing by July 12 whether further in-court evidence needs to be taken. And if so, of whom. And if there is nothing else then, then we can either have oral argument or, you know, in a case like this—

THE CLERK: We have a briefing schedule.

THE COURT: A briefing schedule. All right.

MR. LERNER: Very well, Your Honor. Okay. I accept all those rulings. I feel that I should make at least my position clear for the record.

THE COURT: Yes.

MR. LERNER: I realize that the Court of Appeals used that type of language about the machine in this case, but it was my impression from the [736] Court's concern about the constitutionality of the issue that the issue of thermal imaging in search activity goes beyond the machine itself, and of course the Government opened that door by bringing in somebody from Flir Systems and talking about Flirs and showing the differences between the two cameras. So I

didn't see it—the Government didn't see it as limited either. I accept the Court's ruling but I do feel that this is relevant and I would like to as an offer of proof mark the exhibits and enter them in the record as an offer of proof. I will abide by the Court's ruling and not have Mr. McDowell explain them unless the Court would like us to go through that.

THE COURT: No, I don't think that's necessary. Of course I will let you go ahead with and mark the exhibits and make them part of the record for an appeal.

MR. LERNER: So, if I may, for the record Your Honor, Exhibit 118 is the affidavit—I'm sorry, the search warrant that was used to search Mr. McDowell's property and attached to it is the transcribed hearing of the warrant application. Exhibit 119 is the thermal image tape that was part of the basis of the warrant application. As I mentioned, Mr. McDowell would testify that he obtained these through his attorneys and that he then looked at the thermal image tape and did his own personal diagram in order to try and find the locations that they were talking about. And that these locations were found by him and that he went to those locations and videotaped them. That is exhibit 120. That would be the videotape. He went to those locations two months after the thermal image. But the buildings exhibited in that tape recording showed they were abandoned, ramshackled structures overgrown with blackberries that could not have been in that condition—in a much better condition two months previously. I think the exhibit speaks for itself. Exhibit 121 are the police reports. I haven't given a copy to Mr. Thomson yet, but they attest to the fact that a search was conducted and that there was no marijuana grow on there, a mistake had been made. It also indicates that the DEA agent was the one that did the thermal imaging which is our point that it does rebut Mr. Stowell. That would be my offer of proof on this matter.

THE COURT: All right. And we will receive those as part of the offer.

PETITIONER'S

BRIEF

Supreme Court, U.S.
FILED
NOV 13 2000
CLERK

No. 99-8508

IN THE

Supreme Court of the United States

DANNY LEE KYLLO,

Petitioner,

v.

UNITED STATES OF AMERICA,

Respondent.

On Writ of Certiorari to the United States Court of Appeals for the Ninth Circuit

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BRIEF FOR PETITIONER

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QUESTION PRESENTED

WHETHER THE WARRANTLESS USE OF A THERMAL IMAGING DEVICE TO DETECT HEAT SOURCES WITHIN A HOME CONSTITUTES AN UNREASONABLE SEARCH AND SEIZURE UNDER THE FOURTH AMENDMENT TO THE UNITED STATES CONSTITUTION.

RULE 24.d CITATION

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IN THE

Supreme Court of the United States

No. 99-8508

DANNY LEE KYLLO,

Petitioner,

v.

UNITED STATES OF AMERICA,

Respondent.

On Writ of Certiorari to the United States Court of Appeals for the Ninth Circuit

BRIEF FOR PETITIONER

Basis of Jurisdiction

On September 9, 1999, a panel of the Ninth Circuit Court of Appeals affirmed the judgment of the United States District Court for the District of Oregon. A Petition for Rehearing with Suggestion for Rehearing En Banc was denied on December 14, 1999. A timely Petition For Writ Of Certiorari was filed on March 3, 2000. This Court has jurisdiction over this case pursuant to 28 U.S.C. § 1254(1).

Constitutional Provisions

The Fourth Amendment to the United States Constitution provides:

> The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized.

STATEMENT OF THE CASE

A. Background

Danny Lee Kyllo was arrested in his home on January 27, 1992 by a team of officers executing a search warrant for evidence of marijuana manufacturing (JA 6). In the affidavit supporting the search warrant, United States Bureau of Land Management (BLM) Agent William Elliott never alleged that Mr. Kyllo had been recently observed either possessing, selling, or growing marijuana. Instead, he sought to establish probable cause based on i) the results from a thermal imaging scan of Mr. Kyllo's residence taken by an Oregon National Guardsman, from which the affiant concluded that high levels of heat emanated from Mr. Kyllo's roof and walls; (ii) the fact that Mr. Kyllo's next door neighbor, Tova Shook, was suspected of criminal conduct; (iii) electric power consumption records; (iv) alleged criminal activities of Kyllo's estranged wife, more than a year in the past, without disclosing their estrangement; and (v) two-year-old triple hearsay from an informant.

The actual target of the investigation was Sam Shook, and information led investigators to believe that his daughter, Tova Shook, was also involved (Lodging, S.W. Affid. JA 87).[1] The investigation focused by happenstance on Mr. Kyllo because he lived next door to Tova Shook, and Tova lived with Lori Kyllo (JA 87).

The thermal image of Mr. Kyllo's home showed white blotchy areas on the roof and a white garage wall (Gvt. Exh. 1). This indicated to the operator, National Guard Sergeant Dan

[1] Relevant exhibits introduced in the district court are being lodged with the Clerk of the Court for convenient reference, either because they are videotapes, photographs, and brochures that do not copy well, or are on standard 8½ x 11 documents that could not be reduced to appendix format. The search warrant and affidavit, with its attached exhibits, are so lodged, and also appear in the district court file (DCR 7, 31) and in Appellant's Excerpt of Record (Volume I) in the Court of Appeals.

Haas, that pockets of more intense heat were beneath the roof and perhaps in the garage (JA 66-68; SW Affid. Exh. F). He concluded that this was consistent with marijuana growing, and these results were included in the search warrant application.

Pursuant to the warrant, officers searched Mr. Kyllo's home and found marijuana being grown in Mr. Kyllo's attic, but not in his garage. They seized growing marijuana plants, grow equipment, dried marijuana, and various personal items including two handguns (DCR 9-10). Mr. Kyllo was subsequently indicted for manufacturing marijuana (DCR 13).

B. District Court Proceedings

Mr. Kyllo filed a motion to suppress evidence. He challenged the warrantless use of the thermal imaging device, and requested a *Franks*[2] hearing with regard to alleged false statements and omissions by the search warrant affiant (DCR 30). The district court granted a hearing limited to the allegation that a purported Portland General Electric (PGE) power consumption chart was distorted to draw a false picture of Mr. Kyllo's actual electrical consumption in order to assert that there was "excessive power usage" at his home (DCR 39). The court refused to take evidence on other areas of alleged falsity or on the issue of thermal imaging.

The *Franks* hearing spanned several days (DCR 43-44, 51). On December 4, 1992, the court issued a written order and opinion denying the Motion to Suppress (Pet. App. G). The court concluded that the affiant did not act recklessly in using the PGE chart (Pet. App. G, p. 9). Based only on legal argument, the court also ruled that the warrantless use of thermal imaging to track heat sources at Mr. Kyllo's residence was not an unreasonable search and seizure under the Fourth Amendment; thus, the results could be used to support probable cause.

[2] *Franks v. Delaware*, 438 U.S. 154 (1978).

Mr. Kyllo entered a conditional plea of guilty preserving his right to appeal the denial of his motion to suppress (DCR 69-70). He was sentenced to a term of 63 months imprisonment (DCR 73). The district court granted bail pending the outcome of Mr. Kyllo's appeal of the denial of his motion to suppress (DCR 77).

C. First Opinion by the Ninth Circuit

On appeal, the United States Court of Appeals for the Ninth Circuit vacated the conviction and remanded the case for an evidentiary hearing on the intrusiveness of the thermal imaging device and for a further *Franks* hearing. *United States v. Kyllo (Kyllo I)*, 37 F. 3d 526 (9th Cir. 1994) (Pet. App. F). The panel determined that Agent Elliott's power record presentation was false and misleading. *Kyllo I*, 37 F. 3d at 528.[3] However, that court could not conclude that the district court clearly erred when it found that the false and misleading claims were negligent, rather than reckless. The court also held that Kyllo had made a substantial preliminary showing that other deliberately false assertions were made about his marital status to tie him to recent drug sales.

D. Proceedings on Remand

In June 1995, the evidentiary hearing began, focusing on the capabilities of the thermal imaging device used in this case. Thermal imaging permits one to detect information that is

[3] First, the affiant misrepresented the purpose of the PGE power chart, falsely telling the magistrate that PGE had "developed a guide for estimating appropriate power usage." Second, he deliberately altered the chart by cutting all of the figures in half, thereby grossly misrepresenting that Mr. Kyllo was over-consuming electricity when he was not. Third, he made erroneous assertions that there was a "maximum" monthly power usage that would be "appropriate" for a home the size of Mr. Kyllo's when the chart only established monthly averages on an annualized basis. Fourth, he arranged the starting and ending months of Mr. Kyllo's power records that he referenced in the affidavit in a way that created an illusion that his electrical consumption was building up.

unavailable to the unaided eye (JA 16, 36, 47, 94-6, 115, 157). The Agema 210 used in this case looks and operates much like a conventional video camera. Normal cameras operate on the basis of light, however thermal imagers detect heat in the thermal infrared range of the electromagnetic scale, which is beyond the range of visible light (JA 15-7, 92-4). The information detected can be converted to digital or visual information, enabling one to actually "see" what is invisible to the naked eye (JA 15, 93-4).

All objects radiate or emit invisible thermal infrared energy. Many objects absorb thermal energy from other sources radiating toward them, much as sand on the beach is heated by the sun. These materials then reemit, or transmit, this additional thermal energy beyond the standard emittance characteristics of the material itself (JA 48-50, 95-6, 118). The thermal image operator refers to this phenomenon as a thermal variation or anomaly (JA 28, 48-9).

Because of these properties, thermal imaging allows one to gather information about what might be behind a barrier, by using the imager on the barrier itself to see if additional heat is being transmitted through it (JA 24-5, 49-50, 68, 71, 73-4, 81, 95-6, 115). This is the heat signature, often spoken of in shorthand as the ability to "see through" a wall or barrier when the signature is detected (JA 24-5, 95-6, 109).

Thermal imagers can pinpoint locations of high heat sources within a structure (JA 49-50, 73, 81-2, 86, 95, 109), and can detect heat anomalies through virtually *any* barrier, from roofing material (JA 73), to tin Quonset huts (JA 25), apartment buildings, asphalt and concrete paving material (JA 112, 115), and black or colored plastic sheeting (JA 24). The better the machine, the more subtle the variations of temperature that can

be detected, and the more well-defined the image that is seen (JA 98; Lodging, Def. Exh. 108).[4]

The heat signature has a particular meaning to a trained operator. In this case, thermal imaging revealed white blotchy areas on the roof of Mr. Kyllo's house and showed that the wall of his garage was white, indicating high heat loss (Lodging, S.W. Affid. Exh. F). Sgt. Haas claimed that this "was unusually high compared to comparable residences in the proximity...and the heat signature was indicative of indoor marijuana grow operations . . ." (S.W. Affid. P.18).

Thermal imagers reveal more than mere hot spots. Despite promotional literature to the contrary,[5] thermal imagers that use the near-to-visible end of the thermal infrared scale, like the Agema Thermovision 210, can "see through" glass (JA 52, 54, 101-3).[6] The thermal imager can detect and record human activity inside of a darkened room through a closed window. (JA 54, 101-3). Videotapes demonstrated that the Agema, and other imagers, gain images through glass barriers quite well (JA 101-3; Def. Exh. 108), particularly at night when the thermal

[4] Exhibit 108 is a videotape prepared by the defense expert that contrasts the images displayed by the Agema Thermovision 210 used in this case with images attainable by a more sophisticated Mitsubishi imager.

[5] The government and the promoters of thermal imaging often claim that imagers cannot penetrate glass because of its reflective quality. (Lodging, Def. Exh. 102, p. 14).

[6] No thermal imager detects the entire infrared spectrum (JA 50-1). Some thermal imagers detect wavelengths on the near (to visible) end of the thermal infrared scale, typically in the range of 3-5 microns (JA 51, 93). Other imagers detect wavelengths farther on the scale, in the range of 8-14 microns (JA 93-4). With certain lenses, the near-end cameras can detect down to the range of 2 microns, overlapping the visible light scale (JA 93).

imaging device is most likely to be used by police (JA 102)[7]. No one seriously disputed the ability of a thermal imager to detect human activity, even whether people were embracing, inside a dark room at night if a window was open (JA 56, 165-6).

Thermal imaging is becoming ever more technologically advanced at an astounding pace, with virtually limitless application (JA 38-9, 42-3, 133, 160-1). It is now possible to obtain clear images of items no bigger than an inch or two from navigable airspace, and computers can provide for even greater enhancement. (JA 43) The military is the largest market for thermal image technology, and is taking an increasing role in domestic law enforcement (JA 152).

On March 15, 1996 the district court issued an opinion and order (Pet. App. H), once again concluding that the use of the thermal imager was not a search under the Fourth Amendment. The court also concluded that the affiant did not deliberately or recklessly omit facts from the search warrant affidavit about Mr. Kyllo's marital status.

Taking into account Mr. Kyllo's cooperation, his unblemished record, his steps toward rehabilitation, as well as his good conduct and full employment over the four year period that he had been on release, the court imposed a sentence of one month imprisonment, to be followed by a period of supervised release. (Pet. App. I).[8] The court continued Mr. Kyllo's bail pending the outcome on appeal. (DCR 196).

[7] Government witnesses admitted that ground based thermal imagers are used furtively, in covert operations at night (JA 153), and can easily detect images from a distance of one-half mile to a mile (JA 161).

[8] On October 21, 1996, the court took new testimony on resentencing and determined that two firearms that had been found in Mr. Kyllo's home were not possessed in relation to the offense. The court found that he fit the criteria for safety valve treatment. 18 U.S.C. § 3553(f).

E. Ninth Circuit's *Kyllo II* and *Kyllo III* Opinions

Mr. Kyllo appealed anew. This time, the Ninth Circuit concluded in a 2-1 decision that Mr. Kyllo had a reasonable expectation of privacy in his home from thermal imaging, and again vacated the conviction and remanded the case. *United States v. Kyllo* (*Kyllo II*), 140 F. 3d 1249 (9th Cir. 1998). (Petition Appendix E). The panel found that he had a subjective expectation that activities conducted within his home would remain private. *Kyllo II*, 140 F. at 1252. The court also examined the facts, noting the lack of dispute that thermal imaging can reveal intimate activities in a bedroom. *Id.*, at 1254. The majority concluded that the purpose of thermal imaging is to reveal heat signatures of activities occurring inside a structure, and held that this intrudes upon activity that is "sufficiently intimate" to constitute a search in violation of the Fourth Amendment. *Kyllo II*, 140 F. 3d at 1254.

While the government's petition for rehearing was pending, the author of the *Kyllo II* opinion resigned from the bench for health reasons, and a replacement was selected, over Mr. Kyllo's objection.[9] This new panel granted the government's petition for rehearing, with the new judge siding with the former dissenter to make a new majority. The remaining member of the former majority dissented (Pet. App. D). This panel later dispensed with oral argument, and withdrew the *Kyllo II* opinion (Pet. App. C). It then issued a new 2-1 opinion holding that Mr. Kyllo had no reasonable expectation of privacy from thermal imaging of his home, and that thermal imaging does not constitute a search under the Fourth

[9] Mr. Kyllo asserted that the selection of a different judge after issuance of an opinion resulted in formation of a new three-judge panel, and that one such panel may not overrule the decisions of another panel of equal authority.

Amendment. *United States v. Kyllo* (*Kyllo III*), 190 F. 3d 1041, 1046 (9th Cir. 1999) (Pet. App. A).[10]

The court employed the test distilled from *Katz v. United States*, 389 U.S. 347 (1967). First, the majority concluded that Mr. Kyllo did not exhibit a subjective expectation of privacy in the heat coming from his home because he took no affirmative action to conceal "waste heat emissions." *Kyllo III*, 190 F. 3d at 1046. The opinion compared the thermal scan of these emissions to a trained police dog used to detect the odor of illicit drugs, and relied on other federal circuit cases that reach the same conclusion. *United States v. Robinson*, 62 F. 3d 1325 (11th Cir. 1995); *United States v. Ford*, 34 F. 3d 992 (11th Cir. 1994); *United States v. Myers*, 46 F. 3d 668 (7th Cir. 1995).

The majority also opined that even if Mr. Kyllo could demonstrate a subjective expectation of privacy, society would not recognize such an expectation as objectively reasonable in any event. *Kyllo III*, 190 F. 3d at 1046. The opinion reasoned that this Court has permitted non-intrusive observation from outside of the home of activities within a residence or its curtilage, and that the use of technology to enhance surveillance does not necessarily convert such non-intrusive observation into an impermissible search. *Kyllo III*, 190 F. 3d at 1047. The majority looked to whether the thermal imager revealed intimate details and concluded that it did not.

[10] Each panel below has agreed that most of the other information provided in, or omitted from, the search warrant affidavit was false and misleading, but that the district court's finding that these were not in reckless disregard of the truth was not clear error. *Kyllo*, 37 F. 3d at 528 (power consumption assertions were "false and misleading"). *Kyllo III*, 190 F. 3d at 1047 (omission of marital breakup and landlord's information was misleading). The government has never suggested that the affidavit contains sufficient probable cause without the thermal imaging results. *Kyllo III*, 190 F.3d at 1050.

The dissenting judge disapproved of unwarranted thermal imaging based on the sanctity of the home. *Kyllo III*, 190 F. 3d at 1048. The dissent relied on this Court's direction that a search can occur without any trespass. The proper focus, according to the dissent, should be on the homeowner's expectation of privacy in activity occurring in the interior of the home, not on a non-existent expectation as to thermal emissions. *Kyllo III*, 190 F. 3d at 1049. Such emissions are not comparable to garbage because there is no conscious, purposeful exposure. To the dissent technological amplification of the human senses was a critical factor because it impermissibly defeats the expectation of privacy.

The dissent criticized the majority for wrenching the "intimate detail" language out of its proper context to fashion a new test. Rather, the dissent noted other cases that have addressed the issue, and agreed that society would regard Mr. Kyllo's expectation of privacy in his home as reasonable. The thermal imager can detect a great deal of innocent private heat-producing activity inside the home, despite the fact that the images themselves are only gross. *Kyllo III*, 190 F. 3d at 1050.

A petition for rehearing with suggestion for rehearing en banc was denied (Pet. App. B). Mr. Kyllo filed a timely petition for a writ of certiorari, which this Court granted on September 26, 2000.

SUMMARY OF ARGUMENT

The text of the Fourth Amendment expressly provides for protection of the home against unreasonable searches and seizures. This Court has repeatedly emphasized that the right to retreat and be free in one's home from unreasonable government intrusion is at the very core of the Fourth Amendment. *Oliver v. United States*, 466 U.S. 170, 178 (1984). Therefore, whether thermal imaging is a search of the home is dispositive because warrantless searches of the home are *per se* unreasonable unless a well-recognized exception to the warrant

requirement exists. *Payton v. New York*, 445 U.S. 573, 587 (1980).

Thermal image monitoring of the home, to detect invisible thermal radiation as it passes through the walls of a house, strips us of our most basic boundary of personal privacy by electronically gathering invisible information coming from the interior of the home. It is an unconstitutional search under the Fourth Amendment. It overcomes normal privacy barriers in the same way as the electronic monitoring disapproved of in *United States v. Karo*, 468 U.S. 705, 715-716 (1984) and in *Katz v. United States*, 389 U.S. 347 (1967). In fact, thermal imaging is *more* intrusive than the beeper in *Karo* because it pinpoints the specific location of heat sources inside the home.

The *Katz* test is inapposite because this case deals with a search of the home. *Katz* is correctly applied in cases dealing with expectations of privacy in places *other* than the home, where individual and societal expectations of privacy are less clear. Where *Katz is* helpful is in its recognition that the Fourth Amendment can be violated without any physical intrusion or trespass.

Even if *Katz* were the proper analytical method, Mr. Kyllo certainly had a subjective and reasonable expectation of privacy in the activities he conducted in his home. He took normal precautions against observation by conducting his activities inside his home. The Fourth Amendment does not require that citizens take extreme measures to protect the privacy of what one cannot see, feel, hear, taste, or smell out of fear that the government might be able to employ new technologies that reveal what may be going on inside their homes.

Mr. Kyllo did not knowing expose his conduct, or his thermal radiation, to the public. Thermal imaging is extra-sensory and permits the police to "see" what is invisible to the naked eye, even though thermal radiation is not intentionally exposed to public view. It is qualitatively different from mere sense enhancement that improves upon what any member of the

general public is able to observe. When technology can exceed the natural senses, it subverts the human ability to contain private matters in a normal way and threatens the core expectation of privacy in the home.

Society regards as reasonable the expectation of privacy from such intrusive scanning of the home. Thermal imagers should be used only when authorized by a warrant.

The *Kyllo III* majority decision, and the cases on which it relies, is flawed in many ways.

First, as discussed above, the *Katz* test should not apply to searches of the home.

Second, even if *Katz* applies, the majority opinion misframed the issue by failing to focus on the government's monitoring activity and the purpose of the Fourth Amendment to prevent arbitrary invasions of personal privacy.

Third, the majority rejects the reality that activities conducted within the confines of the house, out of sight or plain view of the public, demonstrate an actual desire for privacy, and instead requires the occupant to do more to demonstrate a subjective expectation of privacy.

Fourth, it downplays or ignores the extra-sensory nature of thermal imaging, thereby dispensing with any knowing and voluntary act of exposure by the occupant.

Fifth, the majority mischaracterizes the natural migration of thermal radiation as waste heat, wrongly analogizing it to garbage that is intentionally discarded.

Sixth, the majority wrongly analogizes thermal imaging at the home to dog sniffs, which have been permitted by this Court at airports but not at homes.

Seventh, the majority's reliance on the fact that imagers do not physically penetrate the walls of the home is misguided because such penetration has long been rejected as a criterion for evaluating a search.

Eighth, the majority erroneously injects a completely new criterion into Fourth Amendment jurisprudence by seeking to

determine whether intimate details are revealed by thermal imaging.

The majority below ultimately concludes that thermal imaging does not even constitute a search, reasonable or otherwise. This places thermal imaging beyond constitutional restraint, thereby abandoning judicial control over evolving technological surveillance and jeopardizing every person's right to be left alone. The public justifiably expects that the walls of our homes sanctify a zone of privacy against the government, and represent physical barriers that assure our privacy. These walls are not conduits of invisible information that the government may electronically scan without judicial approval.

The analysis below permits a citizen's normal and reasonable expectation of privacy to be easily overcome by some unanticipated technological advance simply by lack of knowledge or inaction. Under this view, the people can never be secure in their houses against unreasonable searches and seizures because they can never know what special precautions must be taken against new technology or surveillance techniques. For this reason, this Court has insisted on using normal expectations of privacy based on "well-recognized Fourth Amendment freedoms," not on the fortuitous announcement of new scientific developments. *Smith v. Maryland*, 422 U.S. 735, 740 n.5 (1979).

ARGUMENT

I. HOMES ARE ENTITLED TO THE GREATEST PROTECTION UNDER THE FOURTH AMENDMENT.

A. This Court Has Long Recognized The Sanctity Of The Home.

The Fourth Amendment expressly provides that "[t]he right of the people to be secure in their . . . houses . . . against unreasonable searches and seizures, shall not be violated."

The core value that the Fourth Amendment protects is personal privacy.

> The sanctity of the home is not to be disputed. But the home is sacred in Fourth Amendment terms not primarily because of the occupants' *possessory* interests in the premises, but because of their *privacy* interests in the activities that take place within.

Segura v. United States, 468 U.S. 796, 810 (1984) (emphasis in original); *see also Burdeau v. McDowell*, 256 U.S. 465, 475 (1921)(purpose of the Fourth Amendment is "to secure the citizen in his right of unmolested occupation of his dwelling").

For this reason, this Court has repeatedly held that homes deserve heightened constitutional protection from searches and seizures. "[T]he overriding respect for the sanctity of the home...has been embedded in our traditions since the origins of the Republic." *Payton v. New York*, 445 U.S. 573, 601 (1980). The right of a person to retreat into the home and there be free from unreasonable governmental intrusion is at the very core of the Fourth Amendment, *Silverman v. United States*, 365 U.S. 505, 511 (1961), and has long been subject to constitutional protection. *Boyd v. United States*, 116 U.S. 616, 630 (1886). The Fourth Amendment "reflects the recognition of the Founders that certain enclaves should be free from arbitrary government interference." *Oliver v. United States*, 466 U.S. 170, 178 (1984).

This Court has long adhered to the principle that warrantless searches of the home are *per se* unreasonable.

> At the risk of belaboring the obvious, private residences are places in which the individual normally expects privacy free from governmental intrusion not authorized by a warrant, and that expectation is plainly one that society is prepared to recognize as justifiable. Our cases have not deviated from this basic Fourth Amendment principle. Searches and seizures inside a home without a warrant are presumptively unreasonable absent exigent circumstances.

United States v. Karo, 468 U.S. 705, 715-716 (1984). "[T]he Fourth Amendment has drawn a firm line at the entrance to the house." *Payton*, 445 U.S. at 590.

The fundamental and dispositive question here is whether thermal imaging actually *is* a search of the home. Simply put, if thermal imaging is search activity, then Mr. Kyllo's conviction must be reversed because the warrantless search of his home was *per se* unreasonable.

B. Electronic Monitoring Of A Home Is A Search And Requires A Warrant.

The government used thermal imaging to determine what Mr. Kyllo was doing in the privacy of his home. By locating abnormal heat in his roof and walls, the government detected that Mr. Kyllo was using high intensity lights which are commonly used in growing marijuana. The government gathered this information about the interior of Mr. Kyllo's home, even though it could not have otherwise been known without physically entering the premises. *Karo*, 468 U.S. at 715.

Under *Karo*, this kind of electronic monitoring of the home violates the Fourth Amendment. Many lower courts have applied this Court's analysis in *Karo* to conclude that thermal imaging constitutes an unreasonable search and seizure within the meaning of the Fourth Amendment. *United States v. Field*, 855 F. Supp. 1518 (W.D. Wis. 1994); *United States v. Elkins*, 95 F. Supp. 2d 796, 812 (W.D. Tenn. 2000); *United States v. Cusumano*, 83 F. 3d 1247, 1251-1265 (10th Cir. 1996) (en banc, *decided on other grounds*)(McKay, Seymour, Henry, JJ. dissenting). *Commonwealth v. Gindlesperger*, 743 A. 2d 898 (Pa. 1999); *State v. Young*, 123 Wash 2d 173, 867 P. 2d 593, 604 (1994); *People v. Deutsch*, 44 Cal. App. 4th 1224, 52 Cal. Rptr. 2d 366 (1996); *State v. Siegel*, 934 P. 2d 176 (Mont. 1997).

1. *Electronic monitoring of homes is an impermissible intrusion.*

In *United States v. Karo*, 468 U.S. 705, 708-10 (1984) the government electronically tracked a drum of chemicals over public roads, into a private residence. This Court held that warrantless electronic surveillance *of the residence* was as unconstitutional as if the agent had personally entered the home in secret. *Karo*, 468 U.S. at 715. The beeper revealed to the agents that the article of interest was located, and remained, inside the residence. The Court held that the Fourth Amendment does not allow the government to use electronic devices to determine "whether a particular article--or a person for that matter—is in an individual's home at a particular time." *Karo*, 468 U.S. at 716.

This Court rejected the contention that such monitoring "constitutes only a minuscule intrusion on protected privacy interests." *Karo*, 468 U.S. at 717. Even though this was not "a full-scale search," it revealed "a critical fact about the interior of the premises that the Government [was] extremely interested in knowing and that it could not have otherwise obtained without a warrant". *Karo*, 468 U.S. at 715.

Thermal imaging is much like the monitoring this Court condemned in *Karo*.

> [T]he imager records the heat escaping from the walls that is emitted by an object on the other side of the wall. To the extent the device can pick up such radiation and record it, it can "see through" walls.

Field, 855 F. Supp. at 1519; *see also Young*, 867 P. 2d at 598 (thermal imager allows government to, in effect, see through walls).

There is a striking approach/avoidance dichotomy over *Karo* in lower court opinions. Virtually every opinion finding warrantless thermal imaging to be unconstitutional views

Karo as persuasively on point.[11] Conversely, none of the cases that approve of warrantless thermal imaging even mention or attempt to distinguish *Karo*.

While this Court has never specifically defined what is impermissible search activity,[12] nor announced particular analytical factors for examining the government's conduct, the Court has expressed frequent concerns over monitoring activity, or stealthy electronic intrusions. *California v. Ciraolo*, 467 U.S. 207, 215 (1986). *Katz* condemned the government's "activities in electronically listening to and recording" a conversation. 389 U.S. at 353. *Karo* condemned the electronic monitoring of a beeper in a private residence. 468 U.S. at 714-716. Thermal imaging is *more* intrusive than the beeper in *Karo* because "the beeper was not sensitive enough to reveal the can's precise location within an enclosed structure . . . In contrast, the infrared device . . . reveals the specific location of heat within the home." Young, 867 P. 2d at 602; *see also Field*, 855 F. Supp. at 1519; *Cusumano*, 83 F. 3d at 1255.

In *Dow Chemical Co. v. United States*, 476 U.S. 227 (1986), which involved a flyover of an industrial plant, this Court expressed grave concern and cautioned against extending the holding to high-tech sophisticated surveillance of the home, or to an area immediately adjacent to a private residence.

> We find it important that this is *not* an area immediately adjacent to a private home, where privacy expectations are most heightened.

Dow Chemical, 476 U.S. at 237 n.4 (emphasis in original).

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[11] *See Field*, 855 F. Supp. at 1530; *Cusumano*, 83 F. 3d at 1263 (McKay, Seymour, Henry, JJ. dissenting); *Gindlesperger*, 743 A. 2d at 905; *Young*, 867 P. 2d at 601-602; *Deutsch*, 52 Cal. Rptr. 2d at 368-369 (1996).

[12] The Court has looked to whether there is a government intrusion, *Oliver v. United States*, 466 U.S. 170, 183-183 (1984), that "violated", *Katz v. United States*, 389 U.S. at 353, "infringed" *United States v. Jacobsen*, 466 U.S. 109, 113 (1984), *Oliver v. United States*, 466 U.S. at 178, or "invaded", *Rakas v. Illinois*, 439 U.S. 128, 143 (1978) an individual's privacy.

Aside from stealthy monitoring, this Court has also looked objectively at *physical activity* of the police to determine that a search occurred in *Arizona v. Hicks*, 480 U.S. 323, 324-325 (1987)(holding that "[a] search is a search, even if it happens to disclose nothing but the bottom of a turntable" when an officer moved stereo equipment to expose serial number). In *Bond v. United States*, 528 U.S.___, 120 S.Ct. 1462, 146 L.Ed2d 365 (2000) this Court recently decided that a person has a legitimate expectation that a piece of personal luggage would not be felt in an exploratory manner to reveal what might be inside.

In *Bond* this Court also noted that physical inspection is more intrusive than purely visual inspection. Technological enhancement that makes invisible thermal radiation visible is not "purely visual" inspection. This sort of sophisticated electronic surveillance relies on much more than the human sense of sight. Sensing the invisible heat waves coming from one's house is more akin to physical inspection, or feeling the heat, because the detector senses (or feels) the radiation. That imagers can convert what is sensed into picture form is merely convenient.

Thus, stealthy electronic probing or exploring of the walls of a house by a thermal imager to determine what is going on inside is much like the squeezing condemned in *Bond*, and the feeling condemned in *Minnesota v. Dickerson*, 508 U.S. 366 (1993).

Thermal imagers can detect a human form in the dark through an open window, *Kyllo II*, 140 F. 3d at 1254; *Young*, 867 P. 2d at 595, and can distinguish if two people are embracing (JA 56, 164-6). It can even detect people through a plywood door. *Young*, 867 P. 2d at 595. Thermal imagers can detect human movement through closed windows, *Kyllo II*, 140 F. 3d at 1249, and perhaps through curtains. (Jt. App. 55-56); *Field*, 855 F. Supp. at 1531. They can reveal the partitioning of rooms in a mobile home, *United States v. Olson*, 21 F. 3d 847, 848 n.5 (8th Cir. 1994), or whether certain rooms are being occupied or used. *Field*, 855 F. Supp. at 1531 n.7; *Young*, 867 P. 2d at 598. They can also reveal if something is hidden in a wall. (JA 82).

2. *Thermal imaging need not physically penetrate to be a search.*

The majority below, and the district court, opined that thermal imaging is not a search because it does not physically penetrate the walls. This argument, drawn from a misreading of *Dow Chemical Co. v. United States*, 476 U.S. 227 (1986), is not only debatable, but is irrelevant. "[T]he fact that the electronic device...did not happen to penetrate the wall of the booth can have no constitutional significance." *Katz*, 389 U.S. at 353.

In *Dow Chemical*, this Court cautioned about "some unique sensory device" that would "raise very different and far more serious questions" than camera surveillance. 476 U.S. at 238-39. The Court specifically referred to a device that "could penetrate the walls of buildings and record conversations in Dow's plants." *Dow Chemical*, 476 U.S. at 238.

This Court's concern was not over *literal* physical penetration but the government's ability to *figuratively* penetrate barriers by using technology that renders such barriers meaningless or superfluous.

> The reasonable expectation of privacy standard was designed to ensure that the Fourth Amendment continues to protect privacy in an era when official surveillance can be accomplished without any physical penetration of or proximity to the area under inspection.

Dow Chemical, 476 U.S. at 247 (Powell, J. dissenting); *see also Minnesota v. Carter*, 525 U.S. 83, 99 (1998) (Kennedy, J., concurring) ("Security of the home must be guarded by the law in a world where privacy is diminished by enhanced surveillance and sophisticated communications systems."). This Court has long since discarded the need to show a physical

trespass, or any penetration of the walls, in order for surveillance to constitute a search. "It is the exploitation of technological advances that implicates the Fourth Amendment . . ." *Karo*, 468 U.S. at 712.

Under this Court's decisions, therefore, a surveillance device intrudes into a zone of privacy if it reveals information within a structure that could not otherwise be known without physical entry. *Karo*, 468 U.S. at 715. The thermal imaging device does this by displaying heat sources coming from within the home.

C. The Majority Below Improperly Focused On The Thermal Radiation Rather Than On Privacy Interests In Activity Conducted Inside The Home.

The court of appeals issued two different 2-1 opinions on this question, reaching opposite conclusions. The later opinion ultimately rejected the practical reality that thermal imaging is a search of the house. To reach this conclusion, it misframed the question. It divorced thermal imaging from its surveillance purpose and incorrectly focused on the fact that it senses the thermal radiation escaping the house, rather than focusing on the individual privacy interests in activities restricted to the interior of a home. Other lower courts have properly maintained the focus on privacy interests protected by the Fourth Amendment. Compare *Kyllo III*, 190 F. 3d at 1046 to *Cusumano*, 83 F. 3d at 1258 (McKay, Seymour, Henry, JJ. dissenting)("*Katz* looked not to the tools employed by the government nor to the phenomena measured by those tools but to the object of the government's efforts"); *see also Elkins*, 95 F. Supp. 2d at 809-10; *Gindlesperger*, 743 A. 2d at 902-03; *Deutsch*, 52 Cal. Rptr. 2d at 368; *Siegel*, 934 P. 2d at 189.

> The machine intrudes upon the privacy of the home not because it records white spots on a dark background but rather because the interpretation of the data allows the government to monitor those domestic activities that generate a significant amount of heat.

Cusumano, 83 F.3d at 1260.

The majority below also erred by concluding that the thermal imaging device intruded into nothing because it only captured information on the outside surface of the home. *Kyllo III*, 190 F. 3d at 1046. Even if one accepts this factual premise, it is a distinction without a difference. Mr. Kyllo's expectation of privacy extends to the curtilage of his home as well, which this Court has always recognized as an extension of the home entitled to privacy protection equal to the home itself. *Oliver*, 466 U.S. at 180. If this were not so, the invasion of the curtilage here would destroy the right to maintain the privacy of activities inside the house.

The *Kyllo III* majority ultimately depended on the rejected physical penetration requirement, and refused to confront the fact that thermal imaging is intended to, and does, discern activity in the home, such as the location of suspected grow lights.

> The whole point of the [thermal imaging] exercise is to attempt to learn what is happening inside of the home. Depending on the skill—or perhaps the audacity—of the person interpreting the thermal image, the government can actually discern, or claim to discern some very detailed information about what is happening inside of a home being scanned.

Field, 855 F. Supp. at 1531; *see also Young*, 867 P. 2d at 603. "The device discloses information about activities occurring within the confines of the home, and which a person is entitled to keep from disclosure absent a warrant." *Young*, 867 P. 2d at 598.

The majority view below would turn the walls of private homes into mere conduits of invisible information that can be detected with developing technology. It ignores the core values

underlying the Fourth Amendment and the reason for the specific reference to the house. Moreover, it ignores the decisions of this Court in the area of electronic monitoring.

D. Additional Reasons For Rejecting Opinion Below.

The majority's conclusion below that thermal imaging does not constitute a search removes all limitations "on the government's ability to use the device on *any* private residence, on *any* particular night, even if no criminal activity is suspected. Such police activity is constitutionally offensive." *Young*, 867 P.2d at 600. "Technological advancements cannot be allowed to defeat the protections of the Bill of Rights." *Elkins*, 95 F. Supp. 2d at 813.

> The ultimate threat of unregulated modern [electronic surveillance] technology could be a stifling police presence which affects the innocent and guilty alike.

ABA Standards for Criminal Justice, Electronic Surveillance, Third Edition, Section B: Technologically-Assisted Physical Surveillance p. 24 (1999) For these reasons, thermal imaging resembles the pernicious general warrant that the Fourth Amendment was designed to prohibit, unlimited in time or place, and applicable to any member of society without regard to individualized suspicion.

> Indiscriminate monitoring of property that has been withdrawn from public view would present far too serious a threat to privacy interests in the home to escape entirely some sort of Fourth Amendment oversight.

Karo, 468 U.S. at 716.

Thermal image monitoring of the home is a search and requires a warrant. A balanced committee of the American Bar Association studied the issue of electronic surveillance and reached this same conclusion, publishing proposed law enforcement standards. *ABA Standards, supra, Standard 2-9.6(a)(i) Detection Devices.*

> Because even relatively primitive thermal imaging devices can detect heat differentials as small as a half-degree...they have the potential for discerning a variety of activities associated with an expectation of privacy.

Id. at 85.

Adopting the reasoning of *Kyllo III* presents a danger that other sophisticated devices, capable of tracking the movements of individuals inside a structure, would likewise be constitutionally permissible. *Gindlesperger*, 743 A. 2d at 903 n.7. It may set the stage for warrantless use of other existing techniques, such as parabolic microphones that pick up conversations by detecting the sound wave vibrations off of glass. This Court suggested that such electronic devices may pose very serious constitutional questions, *Dow Chemical*, 476 U.S. at 239, but these questions might be foreclosed if thermal imaging is not held to be a search. *Cusumano*, 83 F. 3d at 1258.

Thermal imaging, like the beeper in *Karo* and the bug in *Katz*, disregards barriers that are designed to maintain privacy. They gather information coming from the interior of a structure that is inaccessible to the outsider without technologically replacing the human senses. Each of these electronic devices passively receive invisible waves that emanate from within a private place. This Court has long viewed the home as a place of special constitutional stature and a refuge for every citizen, and should reaffirm that principle here by requiring prior judicial approval for the use of thermal imagers at private residences.

II. UNDER THIS COURT'S *KATZ* TEST, THERMAL IMAGING INFRINGES UPON A REASONABLE EXPECTATION OF PRIVACY.

A. The Ninth Circuit Should Not Have Applied The *Katz* Test To A Search Of The Home.

This Court frequently uses the test of *Katz v. United States*, 389 U.S. 347 (1967), to determine whether an alleged search is unconstitutional, by looking at whether certain police activity

violates a reasonable expectation of privacy. The Court has traditionally used this test to assess the reasonableness of expectations of privacy in places other than the home, where privacy expectations are less clearly defined.[13] The assessment of *those* reasonable expectations looks to "a source *outside* of the Fourth Amendment, either by reference to concepts of real or personal property law or to understandings that are recognized and permitted by society." *Minnesota v. Carter*, 525 U.S. 83, 88 (1998) (emphasis added), quoting *Rakas v. Illinois*, 439 U.S. 128, 143-144 n.12 (1978).

Katz itself involved surveillance in a *public* place, not the home. Even after declaring that "the Fourth Amendment protects people, not places," *Katz*, 389 U.S. at 351, this Court reaffirmed the traditional protection of privacy in the home.

> [B]y holding that the Fourth Amendment protects persons and their private conversations, [*Katz*] was [not] intended to withdraw any of the protection which the Amendment extends to the home.

Alderman v. United States, 394 U.S. 165, 180 (1969).

Katz is not particularly helpful here in answering "the threshold question whether a search or seizure covered by the Fourth Amendment *has occurred*." *Carter*, 525 U.S. at 97 (Scalia J., concurring) (emphasis in original). *See also* Zabel, *A High-Tech Assault on the "Castle": Warrantless Thermal Surveillance of Private Residences and the Fourth Amendment*, 90 Nw. U. L.R. 267, 273, 287 (1995). *Katz* does not directly answer the independent question of whether home privacy was

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[13] It is noteworthy that none of this Court's home search decisions explicity use the *Katz* test, or that the Court has taken it as given that the home is an enclave imbued with a constitutionally protected expectation of privacy from unwarranted searching, with the sole exception of determining whether a third party may expect privacy in another person's house. *See Minnesota v. Carter*, 525 U.S. 83 (1998); *Minnesota v. Olson*, 495 U.S. 91 (1990); *Rakas v. Illinois*, 439 U.S. 128 (1978).

invaded by government action. *Smith v. Maryland*, 442 U.S. 735, 740 (1979).

Accordingly, the court below erred when it used *Katz* instead of *Karo* to conclude that Mr. Kyllo had no actual expectation of privacy in the activities he conducted inside his home. Of course he did. Requiring that he must affirmatively do more in order to show that he expected privacy in his own home, *Kyllo III*, 190 F. 3d at 1046, is anathema to bedrock principles and to the historic underpinnings of the Fourth Amendment. Further, his expectation was reasonable, given the Fourth Amendment right to be secure in one's house and the absence of evidence that he knowingly exposed his activities to view.

B. Properly Applied, *Katz* Confirms Mr. Kyllo's Reasonable Expectations Of Privacy.

Analysis under *Katz* does not yield a different result. Even under *Katz*, Mr. Kyllo did have an actual expectation of privacy which society would regard as reasonable. The court below misapplied both prongs of the *Katz* test, thus concluding that thermal imaging of a residence is not a search.

In *Katz v. United States*, 389 U.S. 347 (1967) this Court broke with a line of cases that had held no Fourth Amendment violation could be found without a physical trespass. *See Olmstead v. United States*, 277 U.S. 438, 466 (1928). Fictional, procedural, or property law concepts thwarted the underlying purpose and function of the Fourth Amendment. *See Warden v. Hayden*, 387 U.S. 394, 304 (1967). *Katz* expressly rejected the physical trespass requirement:

> [O]nce it is recognized that the Fourth Amendment protects people—and not simply "areas"—against unreasonable searches and seizures it becomes clear that the reach of that Amendment cannot turn upon the presence or absence of a physical intrusion into any given enclosure.

Katz, 389 U.S. at 353.

The Court has adopted Justice Harlan's concurring opinion in *Katz* as the test. To be constitutionally protected from a warrantless search and seizure "there is a twofold requirement, first that a person have exhibited an actual (subjective) expectation of privacy and, second, that the expectation be one that society is prepared to recognize as 'reasonable.'" *Katz* at 361 (Harlan, J., concurring). This second element asks whether the government's intrusion infringes upon the personal and societal *values* protected by the Fourth Amendment. *Oliver v. United States*, 466 U.S. 170, 182-83 (1984); *United States v. Chadwick*, 433 U.S. 1, 7 (1977).

The *Kyllo III* majority misinterpreted Justice Harlan's formulation in ways that forsake the constitutional protection of the home.[14] When lower courts focus on the nature of the information captured and a person's failure to block heat emissions rather than the government's actions in relation to the home and the individual's right to be free from arbitrary invasions of privacy, this Court must clarify that *Katz* was meant to promote rather than curtail the vitality of the Fourth Amendment.

C. Under *Katz* Mr. Kyllo Had A Subjective Expectation Of Privacy.

1. *His conduct was inside his home.*

A person may not be required to do more than take normal precautions to maintain privacy. *Rakas*, 439 U.S. at 152 (Powell, J., concurring); *California v. Ciraola*, 476 U.S. 207, 211(1986); *Florida v. Riley*, 488 U.S. 445, 454 (1989)(O'Connor, J., concurring). In our society the home is the quintessential place where one expects privacy. By choosing to

[14] Justice Harlan himself expressed alarm over the lack of attention to the values underlying the Fourth Amendment, leading "to the substitution of words for analysis." *United States v. White*, 401 U.S. 745, 786 (1971) (Harlan, J., dissenting).

conduct his activities inside his home, Mr. Kyllo took the normal precaution needed to be free from observation by the outside world.

The Ninth Circuit majority grudgingly acknowledged that conducting activity inside the home "may well show he had some subjective expectation of privacy in the operation," *Kyllo III*, 190 F. 3d at 1046, but this was somehow not enough. Mr. Kyllo was faulted for taking "no affirmative action to conceal the waste heat emissions," *Kyllo III*, 190 F. 3d at 1046, something that cannot by the laws of nature be completely contained.

This is far more than this Court has ever demanded. The *Kyllo III* majority ignores the normative privacy value in the home, and that Mr. Kyllo "took normal precautions to maintain his privacy", *Ciraolo*, 476 U.S. at 211, by limiting his activity to the interior of his own house, and by not knowingly exposing it. That heat from his home is now capable of being electronically monitored does not override these fundamental considerations.

> More importantly, placing too much reliance on the extent to which the target makes an effort to evade government surveillance would create the risk of encouraging a closed society, in which people routinely restrict their contact with the outside world. With the advent of the technologies at issue here, increasingly greater precautions (thicker walls, heavily curtained windows, avoidance of public exposure) would be necessary to render them ineffective.

ABA Standards, *supra* at 31.

In *Ciraolo*, the erection of a ten foot fence was sufficient evidence of a subjective expectation of privacy even though this Court ultimately found this expectation unreasonable as to naked eye observation from an airplane. In *California v. Greenwood*, 486 U.S. 35 (1988), placing garbage in opaque plastic bags established the owner's subjective expectation that

the contents would remain concealed, although again this Court found the expectation unreasonable. In *Katz*, closing the phone booth was enough to exhibit a desire for privacy, even on a public street. Requiring that a person do more to exhibit an expectation of privacy, particularly for activity in one's own home, would render the first prong of *Katz* meaningless. *United States v. Ishmael*, 48 F. 3d 850, 854 (5th Cir. 1995).

An individual need not anticipate and guard against every conceivable weapon in the government's arsenal to keep private matters within the confines of his or her home. *Cusumano*, 83 F.3d at 1259 (McKay, Seymour, Henry, JJ. dissenting); *Ishmael*, 48 F.3d at 854-55. The majority's view would leave privacy at the mercy of the government's power to exploit technological advances by mere inaction and without any knowing exposure by the individual.

2. *His conduct was not knowingly exposed.*

The fact that thermal radiation coming from inside the house is invisible to the naked eye, and undetectable by other natural senses, supports the common sense reality that such radiation is not knowingly exposed to the public. *Katz*, 389 U.S. at 352. It is most likely that people give little thought to the thermal radiation, both because it is invisible and because it dissipates rapidly in the air.

Moreover, the concept of knowing exposure incorporates the notion that any member of the general public could have made the same "purely visual", *Bond v. United States*, 528 U.S. ___, 120 S.Ct. at 1464, "naked eye", *Ciraola*, 476 U.S. at 215; *Dow Chemical*, 476 U.S. at 234, observation from a lawful vantage point. *Greenwood*, 486 U.S. at 41. These factors are absent in the context of thermal imaging. It is not naked eye or purely visual. The general public does not routinely use thermal imagers to examine their neighbors' homes.

This Court should consider the important privacy values at stake. Humans need heat to survive. Heaters, air conditioners, and fans are commonly used to regulate the temperatures inside homes and other buildings. People naturally expect heat to simply disperse unnoticed. *Siegal*, 934 P.2d at 186. The Constitution does not require citizens to forego the necessities of modern life in order to expect freedom from governmental surveillance of their heat.

Since heat naturally rises and emanates from a warmer body to a cooler one, neither Mr. Kyllo, nor any other member of the public, can do anything about escaping heat. *Field*, 855 F. Supp. at 1532; *see also Young*, 867 P.2d at 603 (the only way to prevent heat from escaping is to turn off all heat sources in the home, even in sub-zero temperatures). That does not mean people relinquish their right to privacy in heat-producing activity in their homes. This Court must, therefore, determine whether the Fourth Amendment's guarantee of personal security in one's home requires citizens to yield to scientific advances that render our traditional barriers to exposure obsolete, or whether a line at the threshold still exists.

D. The Opinion Below Wrongly Applied *Katz*.

By characterizing the migration of invisible heat as waste, the majority below justified electronically sensing the "waste heat" as no greater intrusion than dog sniffs which can detect the odor of illicit drugs. This conclusion was bolstered by reference to decisions of the Seventh and Eleventh Circuits. *United States v. Robinson*, 62 F. 3d 1325 (11th Cir. 1995); *United States v. Ford*, 34 F. 3d 992 (11th Cir. 1994); *United States v. Myers*, 46 F. 3d 668 (7th Cir. 1995).[15] All of these

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[15] *See also United States v. Pinson*, 24 F. 3d 1056 (8th Cir. 1994) *State v. Cramer*, 174 Ariz 522, 851 P. 2d 147 (1992); *State v. McKee*, 181 Wis. 2d 354, 510 N.W. 2d 807 (Wis. App. 1993); *LaFollette v. Commonwealth*, 915 S.W. 2d 747 (Ky. 1996); *State v. Neil* 671 So. 2d 1111 (La. App. 3 Cir. 1996).

cases are predicated on *United States v. Penny-Feeney*, 773 F. Supp. 220 (D. Haw. 1991), *aff'd on other grounds sub nom. United States v. Feeney*, 984 F. 2d 1053 (9th Cir. 1993), the first reported case to hold that thermal imaging was *not* a search. The analogies employed are badly flawed.

1. *The waste heat analogy is wrong.*

The majority below incorrectly characterized thermal radiation as uncontained waste heat and reasoned that detecting waste heat is similar to searching garbage. The waste heat analogy relies on a fundamental misapplication of this Court's ruling in *California v. Greenwood*, 486 U.S. 35 (1988); *see* Zabel, *A High-Tech Assault* at 287-90. This approach is neither good law nor good physics. *People v. Deutsch*, 44 Cal. App. 4th 1224, 52 Cal. Rptr. 2d 366, 368 (1996). [16]

In *Greenwood*, this Court held that society did not accept as reasonable an expectation of privacy in garbage left outside the curtilage of the home because this act made the garbage readily accessible to the public.

> . . . we conclude that respondents exposed their garbage to the public sufficiently to defeat their claim to Fourth Amendment protection. It is common knowledge that plastic garbage bags left on or at the side of a public street are readily accessible to animals, children, scavengers, snoops, and other members of the public.

Greenwood, 486 U.S. at 40. Greenwood assumed a known risk by doing so.

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[16] The Fifth Circuit rejected this analysis in *United States v. Ishmael*, 48 F. 3d 850, 854 (5th Cir. 1995 (waste heat analogy is too restrictive and would render *Katz* meaningless), and held that the defendant did have a subjective expectation of privacy, even in an open field. Three judges of the Tenth Circuit also question the "waste" analogy, *Cusumano*, 83 F. 3d at 1256-59 (McKay, Seymour and Henry, JJ., dissenting), and it has been rejected by the Supreme Courts of Pennsylvania, Washington and Montana. *Gindlesperger*, 743 A. 2d at 898; *Young*, 867 P. 2d at 604; *Siegal*, 934 P. 2d at 185-86 (Mont. 1997); *see also Field*, 855 F. Supp. at 1532.

Escaping heat is unlike garbage that is physically and intentionally taken to the curb for disposal.

> Taking out the trash is a conscious act that affirmatively demonstrates an abandonment of the contents of the trash can. Loss of heat from a home occurs, for the most part, without any conscious decision by the homeowner to relinquish it.

Field, 855 F. Supp. at 1532; *see also Kyllo III*, 190 F. 3d at 1049 (Noonan, J. dissenting); *Young*, 867 P. 2d at 602. The natural emittance of heat from the home cannot be fairly characterized as abandoned, with the same connotation of intentionality or assumption of a preventable risk of detection. *See* Huskins, *Marijuana Hot Spots: Infrared Imaging and the Fourth Amendment*, 63 U. Chi. L. R. 655, 667-71 (1996). It is neither deliberate nor preventable. [17]

The laws of physics, not any action by the individual, control the emission of radiating heat, which naturally escapes through the walls and roof no matter what a person does.

> While choice of building materials and insulation will slow infrared emissions from the inside of a structure, as long as the atmosphere surrounding a structure is cooler than its interior, the laws of thermodynamics dictate that heat will inevitably be transferred to the atmosphere and that this energy cannot be contained indefinitely.

Siegal, 934 P. 2d at 181; *Ishmael*, 48 F. 3d at 854-55 (defendant could not take every precaution against detection of thermal energy); *Young*, 867 P. 2d at 603 (the only way to avoid the risk of exposure would be to turn off all heat sources in the home).

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[17] Mr. Kyllo's case factually differs from others in which courts make fact-bound conclusions based on expelling heat. In *Ford*, 34 F. 3d at 997, *Pinson*, 24 F. 2d at 1058, and *Penney-Feeney*, 773 F. Supp. at 225, the defendants used vents to expel heat from the premises. Mr. Kyllo did not purposefully expel heat from his residence.

Nor is heat emanating from a home accessible to a scavenging public. Unlike garbage, which may be seen and rummaged through, thermal energy radiating from the interior of a home is imperceptible to the human senses and undetectable to the public. And while one person's trash may be another's treasure, there is no similar reason why the public would *want* to examine a person's heat. *See Young*, 867 P. 2d at 603 (it is difficult to say that one should expect people to use sophisticated equipment to view heat).

Further, garbage is left for disposal by garbage collectors, another example of assumption of risk by purposely conveying it to a third party. *Greenwood*, 486 U.S. at 40. Mr. Kyllo did not convey his heat to a third party for collection, disposal, or otherwise.

Finally, comparing naturally emanating heat to intentionally discarded garbage is antithetical to *Katz*. Such an approach might surmise that as Katz spoke he gave off waste sound waves, which traveled to the surveillance device attached to the outside of the telephone booth. Under this approach, Katz could not reasonably expect privacy because he allowed his sound waves to escape. *See Cusumano*, 83 F. 3d at 1257.

2. *Thermal imaging is not similar to canine sniffs.*

Thermal imaging is nothing like a dog sniff. *United States v. Place*, 462 U.S. 696 (1983) (brief detention of a traveler's luggage in order to conduct a canine sniff is reasonable; sniffing is not a search under the Fourth Amendment). It is much more intrusive and nonspecific. It is more susceptible to human judgment, interest, and manipulation. It gathers information that is far beyond the human senses and is therefore more than mere sense-enhancement.

To begin with, this Court emphasized that a canine sniff is "*sui generis*", *Place*, 462 U.S. at 707, and therefore distinct from all other investigative procedures. *Sui generis* means "of

its own kind or class; *i.e.*, the *only one* of its kind." *Black's Law Dictionary*, Revised Fourth Edition (emphasis in original).

> We are aware of no other investigative procedure that is so limited both in the manner in which the information is obtained and in the content of the information revealed by the procedure.

Place, 462 U.S. at 707; *see also Young*, 867 P.2d at 603 (*citing Place*). That being the case, it is inappropriate for comparisons or analogies, even though this Court did extend *Place* somewhat in *United States v. Jacobsen*, 466 U.S. 109 (1984).

Thermal imaging is intrusive. A dog sniff is seen as less intrusive than other searches because it is discreet and does not expose noncontraband items that otherwise would remain hidden from public view. *Place*, 462 U.S. at 707. The dog reacts instinctually; the dog handler is only alerted to the existence of illegal drugs.

Thermal imager is indiscriminate in its ability to detect illegal activity, empowering the government to detect a vast array of innocent heat-producing conduct, *Cusumano*, 83 F. 3d at 1264, such as saunas, pottery kilns, dehumidifiers, or legal indoor gardens. *Kyllo III*, 190 F. 3d at 1050 (Noonan, J. dissenting). It cannot distinguish between "contraband heat" and "legal heat," as the dog sniff distinguishes drugs. A thermal image operator views all heat emanating from the home and is free to draw inferences about the sources of the heat. *Field*, 855 F. Supp. at 1533. Thermal imaging therefore presents dangers similar to the general warrant. It is much broader in scope than the dog sniff, subject to much greater arbitrariness and manipulation, unlimited in time and place, and can be expanded to greater domestic surveillance of legal activity.

Moreover, thermal imaging can never be characterized as instinctual as is the dog's sniff. The animal reacts as trained without any interest in or understanding of the broader

implications of its reaction. The thermal imager must be *operated* and is subject to manipulation by a human being with greater understanding of factual nuances and legal implications. The operator introduces the reality of personal prejudices, professional esteem, and even financial interests by virtue of potential asset forfeiture (Def. Exh. 102, p. 3, 6). The fact that the operator can manipulate the image, choose to videotape or not, "interpret" the image, and even contrive an answer, all contrast with the unique nature of animal instinct.

Analysis of this Court's reasoning in *Place* also demonstrates that it is inaptly stretched to the context of thermal imaging. *Place* concerned a brief *Terry*-type[18] detention of luggage in a very public place. The decision was no doubt influenced by the exigent circumstances inherent in the transitory nature of drug trafficking, and the risk of disappearance, as well as the utter uniqueness of the dog sniff as an investigative tool.[19] It also appears that the public nature of airport travel itself played a role, travel which by its very nature is highly mobile and inevitably subjects travelers and their luggage to minor searches and inconveniences. In this context, subjecting individuals to brief stops and their suspect luggage to a *Terry*-style frisk was regarded as a minimal intrusion when balanced against the needs of law enforcement.

Nevertheless, the Court carefully limited this new doctrine by enunciating a rationale. First, the luggage was not opened, and no noncontraband items were exposed as would be the case

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[18] *Terry v. Ohio*, 392 U.S. 1 (1968).

[19] *Place* did not address the *Katz* test when it said that such sniffs were not a "search" within the meaning of the Fourth Amendment. Therefore it is unknown whether Place himself had no subjective expectation of privacy, whether the Court did not regard his expectation as reasonable, or whether the Court simply carved out a new exception to the stop-and-frisk or warrant requirements. In this specific situation the practicality of accomplishing a luggage frisk in a reasonable suspicion context led the Court to approve of canine sniff, even though there was no armed and dangerous component.

if an officer rummaged through the contents. Second, the manner of obtaining the information was much less intrusive than a typical search. Third, the sniff disclosed only the presence of narcotics, a contraband item. The limited disclosure, in turn, ensured that the owner was not subjected to the embarrassment or inconvenience of more intrusive methods. *Place*, 462 U.S. at 707.

None of the context of *Place* is present with thermal imaging of the home. First, the *Place* doctrine applies to public places, not the home. *Hicks*, 480 U.S. at 327-28; *United States v. Thomas*, 757 F. 2d 1359, 1367 (2nd Cir.) *cert. denied*, 474 U.S. 818 (1986) (use of a dog to sniff for drugs outside defendant's apartment was an unlawful search). Second, there is no exigency, risk of rapid disappearance, or any other circumstance underlying the stop and frisk situation. The detention of a traveler's luggage is a highly specific situation which cannot be equated with surveillance of a private home.

Finally, the limited nature of information gained about the interior of a home, as well as the minimal intrusiveness of the technique have both been rejected as a basis for dispensing with the warrant requirement. *Karo*, 468 U.S. at 715-17.

E. Mr. Kyllo's Expectation Of Privacy Was Reasonable.

The majority below incorrectly concluded that Mr Kyllo did not satisfy *Katz*'s second prong. It did so by failing to examine the electronic monitoring activity against the historical purpose of the Fourth Amendment. Rather, it looked at the result of the search and then asserted that Mr. Kyllo did not establish that his expectation of privacy is objectively reasonable by characterizing thermal imaging as a non-intrusive observation that did not expose any intimate details of his life. The majority was also not troubled by the extra-sensory nature of thermal imaging, noting this Court's cases that approve of the use of technology to enhance surveillance.

This argument is seriously flawed. *First*, the cases the majority relies upon do not involve the heightened privacy protection of the home. *Second*, thermal imaging is not merely sense enhancement. Disregarding this difference carries an unwarranted assumption that whatever the technology is detecting is so knowingly exposed to public view that it can be constitutionally captured without judicial approval. *Third*, the intimate details test wrongly focuses on the results of the search rather than the government's activity.

1. *There is a core privacy value in the home.*

The focus of the second *Katz* prong must be on what personal and societal values are protected by the Fourth Amendment.

> The test of legitimacy is not whether the individual chooses to conceal assertedly "private" activity. Rather, the correct inquiry is whether the government's intrusion infringes upon the personal and societal values protected by the Fourth Amendment.

Oliver, 466 U.S. at 182-183. Therefore, the focus must be on the intrusion and what it intrudes on.

Electronic monitoring of the home is intrusive, as this Court has used that term. This intrusion infringes on personal privacy in the home by capturing with fairly pinpoint accuracy information about activity inside a dwelling that could not otherwise be known without physical entry and inspection. The information gathered need not be intimate or detailed to be an intrusion.

Mr. Kyllo's expectation that the privacy of his home would not be infringed by intrusive electronic monitoring aimed at determining what he was doing inside is one that society is prepared to recognize as reasonable. This is an expectation grounded in our history, our Constitution, and our prevailing customs.

Society would certainly honor a person's normal efforts to maintain privacy, and would respect the right to maintain that privacy by conducting activities purely within the home. Society would be offended by the specter of extra-sensory monitoring of dwellings that breaches this recognized private enclave.

This Court has long expressed concerns about such intrusive technology.

> The progress of science in furnishing the Government with means of espionage is not likely to stop with wire-tapping. Ways may someday be developed by which the Government, without removing papers from secret drawers, can reproduce them in court, and by which it will be enabled to expose to a jury the most intimate occurrences of the home.

Olmstead, 277 U.S. at 474 (Brandeis, J., dissenting).

> But the search of one's home or office no longer requires physical entry, for science has brought forth far more effective devices for the invasion of a person's privacy than the direct and obvious methods of oppression which were detested by our forebears and which inspired the Fourth Amendment. Surely the spirit motivating the framers of that Amendment would abhor these new devices no less.

Goldman v. United States, 316 U.S. 129, 139 (1941)(Murphy, J., dissenting). Limiting the Fourth Amendment to only those methods that physically invade privacy is "bad physics as well as bad law, for reasonable expectations of privacy may be defeated by electronic as well as physical invasion." *Katz*, 389 U.S. at 362 (Harlan, J. concurring).

Similarly, the fact that the intrusion is electronic, therefore passive[20], has never been a basis for dispensing with the Fourth

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[20] Passive devices are the very type of surveillance techniques that are most capable of invading a person's reasonable expectation of privacy in the home by revealing what occurs therein. *Field*, 855 F. Supp. at 1530.

Amendment. In the end, Mr. Kyllo had a perfectly reasonable expectation of privacy in his home from thermal imaging.

2. *Technology that exceeds the human senses destroys the ability to maintain privacy.*

This Court has never said that it is constitutionally permissible to monitor the home with technology that completely replaces the human senses. In fact, this Court has said the opposite. The Fourth Amendment is violated when "the Government surreptitiously employs an electronic device to obtain information that it could not have obtained by observation from outside the curtilage of the house." *Karo*, 468 U.S. at 715.

> . . . it is beyond dispute that the home is entitled to special protection as the center of the private lives of our people. Security of the home must be guarded by the law in a world where privacy is diminished by enhanced surveillance and sophisticated communications systems.

Carter, 525 U.S. at 99 (Kennedy, J. concurring).

The majority below justified its conclusion that society would not regard Mr. Kyllo's expectation of privacy as objectively reasonable because the use of technology to enhance government surveillance does not necessarily turn permissible non-intrusive observation into an impermissible search. The critical inquiry was felt to be whether the technology revealed intimate details, relying on *Ishmael*, 48 F. 3d at 855-56.

For the most part, the sense enhancement cases merely permit police to improve upon what they, or any member of the public, can naturally see on their own. Anyone flying over Dow's plant could have seen what the camera recorded. *Dow Chemical*, 476 U.S. at 238-239. Anyone driving the road could

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Passivity, which makes them undetectable, is their *raison d'etre*. Huskins, *supra* at 685-86.

have followed Knotts's vehicle. *United States v. Knotts*, 460 U.S. 276, 281-282 (1983). Both *California v. Ciraolo*, 476 U.S. 207 (1986), and *Florida v. Riley*, 488 U.S. 445 (1989), are explicitly limited to naked eye observations of the curtilage of the home from a public, albeit unusual, vantage point. Even *Place* involved enhancement of what could have been smelled.

The rationale underlying these cases is found in *Katz*, that "[w]hat a person knowingly exposes to the public, even in his own home or office, is not a subject of Fourth Amendment protection." *Katz*, 389 U.S. at 351. This provides a reasonable guide for protecting one's privacy by protecting only those activities that are not knowingly exposed to public view. However, technology that exceeds the human senses undermines this basic premise.

Surveillance techniques that go beyond the human senses are a quantum leap beyond what people normally expect and have never been approved by this court. Thermal imaging is *extra*-sensory in that it detects what no human can. It is not mere enhancement of the senses. It leaves the homeowner defenseless because the technology overwhelms normal methods of maintaining privacy by rendering our walls and roofs superfluous.

In *Dow Chemical*, a high-resolution camera revealed greater details than could be seen by the unaided eye. Human vision was only "enhanced somewhat," and the pictures were "limited to an outline of the facility's buildings and equipment." *Dow Chemical* 476 U.S. at 238. This Court held that the pictures did not violate the Fourth Amendment, but stated:

> It may well be, as the Government concedes, that surveillance of *private property* by using highly sophisticated surveillance equipment not generally available to the public, such as satellite technology, might be constitutionally proscribed absent a warrant.

Dow Chemical, 476 U.S. at 238 (emphasis added). The Court also found "it important that this enhancement was *not* in an

area immediately adjacent to a private home, where privacy expectations are most heightened." *Dow Chemical*, 476 U.S. at 237 n.4 (emphasis by Court).

Scientific advances that jeopardize the core values of the Fourth Amendment by compromising the traditional barriers of privacy and personal security in the home are a threat to liberty. Mr. Kyllo did *not* knowingly expose his invisible heat to the public, and did *not* relinquish his privacy interest in the activities occurring within his home which produced the heat. His expectation of privacy was completely reasonable. The fact that thermal imaging *can* detect what is hidden behind walls does not mean it should be permitted without a warrant.

3. *Whether intimate details are revealed is not a test for whether an unconstitutional search has occurred.*

This Court has never qualified any activities *within* the home as "intimate" or "non-intimate", thereby placing non-intimate activities beyond constitutional protection.

> Where in the Fourth Amendment or in our cases is there any warrant for imposing a requirement that activity observed must be "intimate" in order to be protected by the Constitution?

Florida v. Riley, 488 U.S. at 463 (Brennan, J. dissenting). Constitutional protection of the home does not depend on characterizing certain activity as intimate, trivial, innocent or criminal. Such a gloss would strip the amendment of its vitality by subjugating the protection of the home to the government's interpretation of the importance or intimacy of activity occurring therein.

All activity occurring within the home is private, and thus protected from government surveillance by the Fourth Amendment, unless it is knowingly exposed. "At the very core [of the Fourth Amendment] stands the right of a [person] to

retreat into his own home and there be free from unreasonable governmental intrusion." *Silverman*, 365 U.S. at 511.

> A resident has a reasonable expectation of privacy in what occurs within the home.

Karo, 468 U.S. at 714, 716.

Constitutional protection of the privacy of the home has never been dependent on the quantity or quality of information sought, and the intrusiveness of any given device is not measured by the "intimacy" of life details it might reveal. *Byars v. United States*, 273 U.S. 28, 29 (1927)(a search in violation of the Constitution is not made lawful by what it brings to light). The Fourth Amendment's core protection of activities within the home does not depend on either the *type* of activity taking place, *Karo*, 468 U.S. at 717 (those suspected of drug offenses are no less entitled to Fourth Amendment protection than others), or the *degree* of intrusion. *Karo*, 468 U.S. at 715, 717; *Hicks*, 480 U.S. at 324.

The *Kyllo III* majority erroneously concluded that any subjective expectation of privacy Mr. Kyllo may have had was not objectively reasonable because thermal imaging does not reveal "intimate details." *Kyllo III*, 190 F.3d at 1046-47. This focus is a misapplication of language from *Dow Chemical Co. v. United States*, 476 U.S. 227 (1986), and from a plurality opinion in *Florida v. Riley*, 488 U.S. 445, 452 (1989). The majority below wrenched these terms from their proper context, to fashion this argument. *Kyllo III*, 190 F.3d at 1050 (Noonan, J., dissenting).

In *Dow Chemical*, the core argument was that Dow had a right to protect its business secrets, and it sought to extend Fourth Amendment protection to the "business curtilage". The Court rejected this argument, noting that the magnified photographs in question were "limited to an outline of the facility's buildings and equipment" and did not reveal "intimate details." *Dow Chemical*, 476 U.S. at 238. This Court's reference to intimate details was only important for distinguishing

the curtilage (a constitutionally protected *extension* of the home) from an open field, *Oliver*, 466 U.S. at 180; *United States v. Dunn*, 480 U.S. 294, 300-301 (1987), and was part of the "business" curtilage analysis.

The majority below wrenched the "intimate details" phrase from its limited context. *Kyllo III*, 190 F.3d at 1049 (Noonan, J. dissenting). As a result, the majority decided that what thermal imaging reveals is not an intimate enough life detail to be protected by the Constitution. But this Court has already noted that a detail is intimate enough if it is "connected with the use of the home." *Riley*, 488 U.S. at 452. The Fourth Amendment is violated when an electronic device is surreptitiously used to obtain information that could not have been obtained by observation from outside the home. *Karo*, 468 U.S. at 715. It does not have to be a sexual secret, a conversation, or even the observation of a human being.

In *Karo*, the object of the electronic surveillance was a can of chemicals, hardly an "intimate detail." In *Arizona v. Hicks*, 480 U.S. 321 (1987), the officer moved a turntable in order to read serial numbers on the bottom.[21] The relevant question should be whether thermal imaging reveals *any* information about the interior of the home that could not have been known without physical intrusion. *Karo*, 468 U.S. at 715-17.

Here, the thermal imager pinpointed the location of heat lamps in Mr. Kyllo's attic that could not have been detected without physical intrusion and inspection. This is a fact "that the Government is extremely interested in knowing and that it could not have otherwise obtained without a warrant." *Karo*,

[21] Even outside the home, this Court has condemned manipulative feeling and squeezing without a warrant that did not reveal "intimate details" but did reveal facts that heightened suspicion. *Minnesota v. Dickerson*, 508 U.S. 366 (1993); *Bond v. United States*, 528 U.S.___, 120 S.Ct. 1462, 146 L.Ed.2d 365 (2000).

468 U.S. at 715. The fact that the images produced by the Agema 210 are crude is not constitutionally significant.[22]

Intrusiveness is not measured by whether intimate life details are revealed. Such a new test would be unworkable, is at odds with traditional ways in which searches are evaluated, and should be avoided for several reasons. *First*, it is a result-oriented approach, assessing the constitutionality of police conduct based on what is discovered. *Second*, intimacy is such a vague, subjective, and standardless concept that people can never know what this will protect. This uncertainty threatens the people's right to be secure in their own homes. *Third*, it would encourage police to rummage at will so long as they don't find anything later viewed as intimate. It is uncertain how much information police could learn about non-intimate details before it would be too much. *Fourth*, it would necessarily thrust the courts into an unprecedented role of making after-the-fact value judgments about people's private lives in order to determine which details society deems intimate enough to reasonably be entitled to an expectation of privacy. This would yield a heretofore unimagined authority to define the extent of personal privacy in the home. *Fifth*, the notion of intimate details fails to focus on the government's conduct and the aims of the Fourth Amendment.

CONCLUSION

The use of a thermal imager to electronically detect information emanating through the walls of one's house, information that is invisible and inaudible to the passerby, transgresses the Fourth Amendment when done by government

[22] The dissent below felt that the gross quality of the pictures, and global nature of the information detected, both made the instrument more invasive than a dog sniff and underscored its unreliability. *Kyllo III*, 190 F. 3d at 1050-51. While Mr. Kyllo challenged the reliability of the thermal imager below, it is not a question presented here for resolution.

agents without a warrant. For all of the reasons stated above, this Court should grant the Writ of Certiorari and reverse the judgment of the Ninth Circuit Court of Appeals.

Respectfully submitted,

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